MODERN Machine Shop

A Magazine for Machine Shop Executives
HOWARD CAMPBELL, Editor

Vol. 4 AUGUST, 1931 No. 3

CONTENTS

	Page
MANUFACTURING "XLO" BROACHES — *By Philip Winter*	11
MODERN MILLING METHODS — *By Wm. K. Andrew*	18
CONVEYOR AT GENERAL ELECTRIC PLANT MAKES ONE BUILDING OUT OF EIGHT	30
ARC WELDING IN THE LOCOMOTIVE BOILER SHOP, II — *By Jas. M. Vossler*	34
IDEAS FROM READERS	42
—SIMPLE METHOD OF MAKING A CONVEYOR SCREW, *By Charles Kugler.*	
—SELF-CLOSING COLLET FOR CENTERING SHORT WORK, *By R. H. Kasper.*	
—MACHINING AN OVERSIZE JOB ON THE BORING MILL, *By S. N. Smith.*	
—FIXTURE FOR PLANING CROSSHEADS, *By John McCullagh.*	
—FIXTURE FOR SLOTTING CASTELLATED NUTS, *By Charles Kugler.*	
—RECLAIMING WARPED MARKING DIES, *By F. B. Helander.*	
—FIXTURE FOR DRILLING SMALL ROUND WORK, *By Harold F. Karrenbauer.*	
"OVER THE EDITOR'S DESK"	52
NEW SHOP EQUIPMENT	54
FOR YOUR CATALOG LIBRARY	82
"THE SCRAP PILE"	88
INDEX TO ADVERTISEMENTS	90

Published Monthly at 128 Opera Place, Cincinnati, Ohio.
DON G. GARDNER, President and General Manager

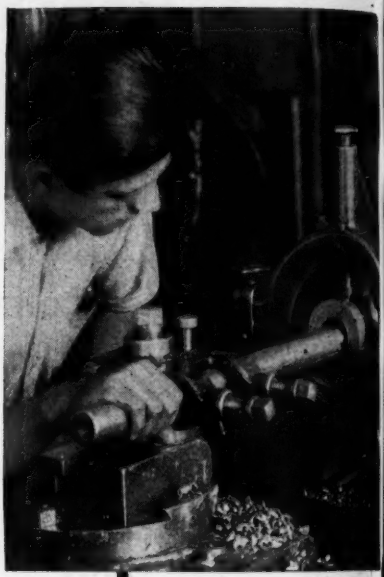
GEORGE H. MEYERS, *Western Manager*, Chicago
RAY GROBECK, *National Advertising Manager*, Cincinnati
H. I. CIRCLE, *Eastern Manager*, New York

(*Copyright* 1931 *by Gardner Publications, Inc.*)

ARMSTRONG TOOL HOLDERS are Used in over 96% of the Machine Shops and Tool Rooms

Apprentices are taught to use ARMSTRONG TOOL HOLDERS at the home of the "House of Magic".....

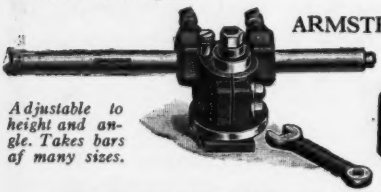
THE selection of tools for tool room and manufacturing processes at the great General Electric plant at Schenectady, N. Y., is as would be expected, based on scientifically accurate knowledge of tool performance. Likewise the training of apprentices is studied and carefully directed—is carefully planned to make them efficient operators, schooled in the most efficient, most practical methods.



ARMSTRONG Adjustable Boring Tool at Apprentice School, General Electric Company.

It is significant to note that both in training and practice ARMSTRONG TOOL HOLDERS play an important part in the shops of this model plant, that where tools are selected after exhaustive tests on a basis of predetermined efficiency, that ARMSTRONG TOOL HOLDERS of all types are used.

The Armstrong System of Tool Holders provides permanent tools that save All Forging, 70% of Grinding and 90% High Speed Steel, for all operations on Lathes, Planers, Slotters and Shapers.



ARMSTRONG Adjustable Boring Bar

Adjustable to height and angle. Takes bars of many sizes.

Buy ARMSTRONG TOOLS from your Supply House

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
328 N. Francisco Ave. Chicago, U. S. A.
London Branch:
ARMSTRONG BROS. TOOL CO., Ltd.
35 Upper Thames Street, LONDON, E. C. 4, England

ARMSTRONG

Tool Holders
Lathe Dogs
"C" Clamps
Ratchet Drills
High Speed Steel Bits
Drop Forged Wrenches
Drilling Posts
Planer Jacks
Machine Shop Specialties

ARMSTRONG BROS.

Dies and Stocks
Pipe Cutters and Wheels
Pipe Vises
Pipe Wrenches and Tongs

Write for Catalog B-27. Shows, describes and prices all ARMSTRONG Tools.

ARMSTRONG

TRADE MARK REG. IN U.S. PAT. OFFICE

MODERN Machine Shop

AUGUST, 1931

CINCINNATI, OHIO

VOL. 4, NO. 3

Manufacturing "XLO" Broaches

Quick Service and Quality Product at Minimum Costs Insured By Use of Modern Equipment

By PHILIP WINTER

THE field of application for the broaching tool is being slowly but surely widened. Formerly considered as adaptable only for the finishing of irregular-shaped holes, the broach has proved its worth for the machining of exterior keyways and for the finishing of exterior flat and curved surfaces as well. The use of the broach as a cutting tool has been promoted by two important factors—the development of better broaching machines, and the ability to withstand the grief to which they are subjected. In this article the reader is given an opportunity to see how such broaches are manufactured at the Continental Tool Division of the Ex-Cell-O Aircraft & Tool Manufacturing Corporation, Detroit, Michigan.

XLO broaches are made from steels that have been selected after analysis, experiment, and laboratory tests have proven them to be most suitable for

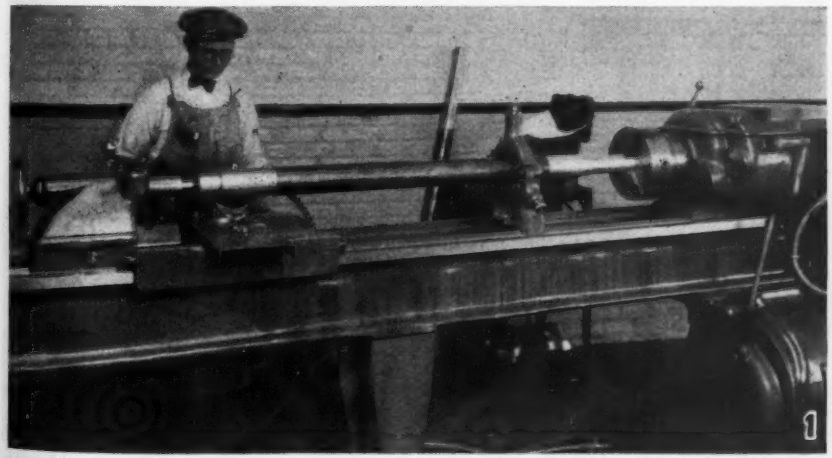


Fig. 1—Turning and cutting the teeth in a broach.

the type of work they will have to do. The quest for better steels for this purpose never ends. The stock comes in bars which are cut to length according to the customers' orders, and then are centered for the lathe. The illustration Fig. 1 shows the operation of turning a round broach from the bar stock. After the bar has been turned to size—leaving the necessary amount for grinding after hardening—the teeth are "spaced" and are cut by the simple process of turning out the clearance between the teeth with a turning tool. On standard broaches that are made in quantities, accurate spacing for the teeth is obtained by the use of an attachment, adapted to the lathe, which makes it possible to duplicate any spacing to a fraction of a thousandth of an inch without the necessity of stopping to measure off the distance between teeth.

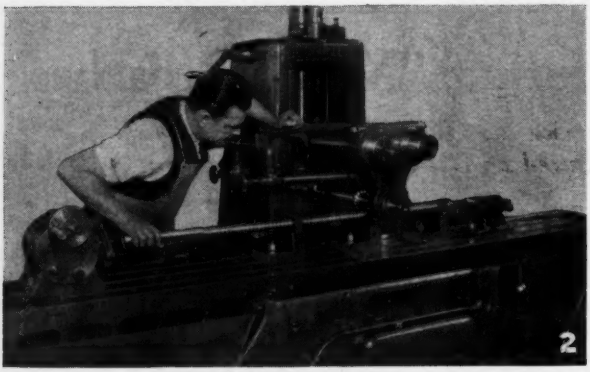


Fig. 2—Milling splines on a broach on a modern milling machine.

After the broach has been turned and the teeth have been cut, the broach is placed between centers in a combination-unit milling machine, as shown in Fig. 2, where the splines are milled. This machine is unusually well adapted for this operation, due to its flexibility in handling as well as its rigidity. Practically any length of broach called for can be handled on this

Fig. 3—General view of the heat treat department, showing the furnaces, straightening presses, and peening benches.

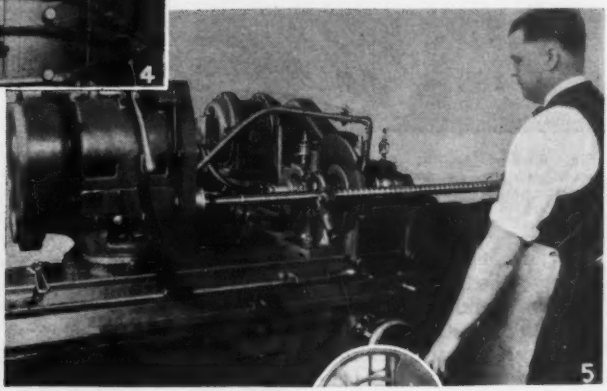
machine. The spline-milling operation is actually the operation of milling the rows of teeth to the correct width, and this operation is held to very close limits.

Fig. 4—Vertical furnaces of the latest type prevent warping the broaches while hot. Fig. 5—Grinding the broach to size after hardening.

In the next operation, the shank of the broach is slotted and the size and necessary identification marks are stamped on the shank. The broach is now ready to be hardened and tempered, for which a complete range of modern heat treating equipment is maintained, as shown in Fig. 3. The heat treat department is equipped with the latest types of horizontal and vertical furnaces, cyanide and lead pots, drawing furnaces, and straightening presses. All furnaces are equipped with electrical recording instruments and electrical controls so that uniform temperature is assured to the entire length of the broach. The equipment shown in Fig. 4 makes it possible to pre-heat, heat, and quench the broaches in a vertical position, thus avoiding any tendency of the broaches to curve or warp out of shape while hot. The illustration shows an operator in the act of removing a broach from one of the vertical furnaces. The broach will immediately be quenched in an oil bath at the left of the operator. The majority of the broaches are quenched in oil upon leaving the furnaces, after which they are given a normalizing or drawing heat.

At the right in Fig. 3 can be seen the straightening presses, and in the center is a row of peening benches. Each broach is carefully checked before it may leave this department.

The teeth of the broach are now



sharpened and the broach is then ground on the outside diameter, as shown in Fig. 5. The machine is a cylindrical grinder of modern design, and is said by the operator to be as accurate as it is simple of operation. Any degree of accuracy required by the customer can be obtained with this machine.

After the periphery of the broach has been ground to size, the broach is ready to have the splines ground. In Fig. 6 is shown a short spline broach set up on a surface grinding machine for the spline-grinding operation. For longer broaches, a grinder

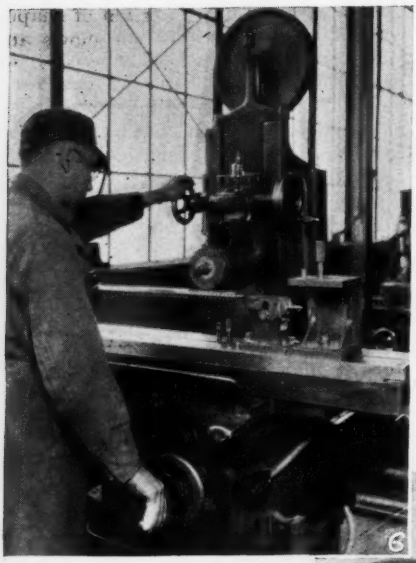
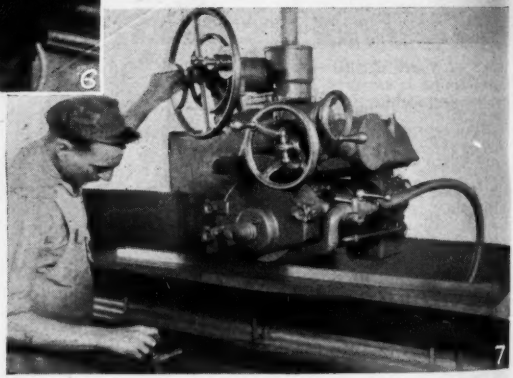


Fig. 6—The splines on short broaches are ground in this surface grinder. Fig. 7—Grinding tops of teeth on a keyway broach.

of a different type, with a longer bed, is used. Ex-Cell-O grinding spindles have been installed on the spline-grinding machines, as these spindles are particularly adapted to this type of operation. The lateral and end thrust of the spindles can be definitely controlled, which is a most important feature in spline grinding. The width and depth of the splines must be held to a thousandth of an inch in order to insure the correct operation of the broach on the job. Another important feature in spline grinding is the accurate indexing of the broach during the grinding operation. Unless an accurate indexing method is used, it would be impossible to perform an accurate job of grinding a spline broach. The spline grinder employed with this indexing method is leased to the Continental Tool Division by the Gear Grinding Machine Company of Detroit.

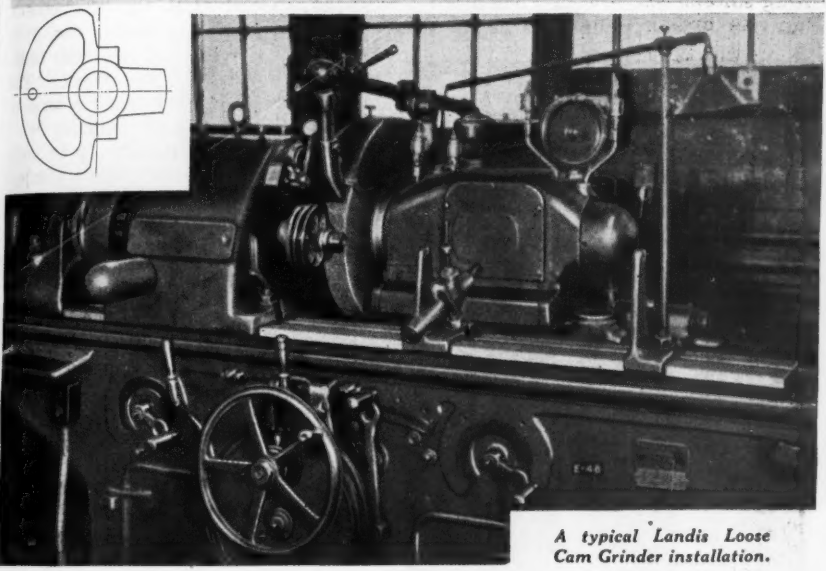
In Fig. 7 is shown the operation of grinding the tops of the teeth of a keyway broach. The operation is performed on a hydraulically-driven surface grinder equipped with a magnetic chuck that is long enough to accommodate broaches of this type.

Some of the different types of broaches made by this company are shown in Figs. 8, 9, and 10. In Fig. 9 is shown a sectional broach, consisting of a hardened and ground broach holder in which are located six high speed steel broach sections. The outstanding advantage of this type of



broach is that, in case a tooth is broken or the broach starts to wear, that section only need be replaced. In a case where the last section is worn undersize, the section is reground and placed one step ahead of its former position and a new section

LOOSE CAMS & ELEVATORS



A typical Landis Loose Cam Grinder installation.

EVERY DAY the lives of thousands of persons are trusted to the faultless performance of elevators in almost all parts of the world.

Although it may never have occurred to you before, there is quite an interesting story back of these elevators. That is to say, they do not just happen. Careful design and precision manufacturing contribute largely to the safety in operation which you take for granted.

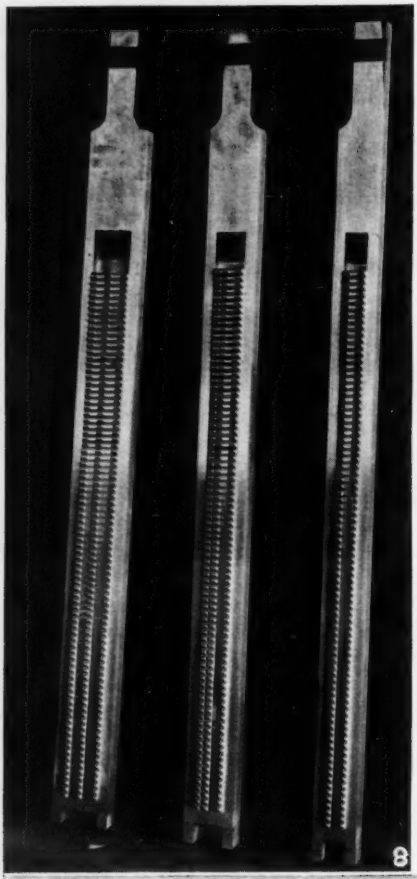
One of the largest of the world's manufacturers of passenger elevators uses Landis equipment for the grinding of loose cams—this piece of equipment being pictured above. The output is twelve cams per hour, removing 1/8" of metal from the side, roughing and finishing in one operation. Limits of accuracy are plus or minus .001" on the diameter. This production is practically doubled when only .050" to .060" stock is removed.

Little is the likelihood that you manufacture elevators. You may use loose cams, however. If you do, you will find it profitable to have Landis engineers check your present output against the possible output which could be secured from the use of modern Landis machines.

LANDIS

LANDIS TOOL COMPANY
WAYNESBORO PENNSYLVANIA
DETROIT CHICAGO NEWARK PHILADELPHIA
89

is placed at the end. This replacement feature has proven very economical. As shown in the illustration, there are three broaches in this set; still, by using suitable spacers, only one fixture and one broach puller are required.



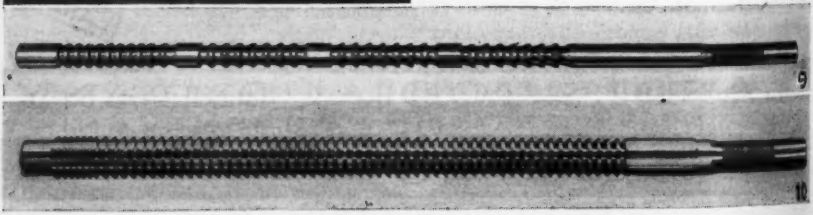
The set was designed especially to meet the requirements of a customer.

A broach of the "non-drift" type is shown in Fig. 9. The drift bearings are so spaced that, as the broach passes through the work, one drift bearing or portions of two drift bearings are always in the work. The broach was designed for use in broaching a hole in a steel cylinder wall, which was approximately 12 in. long with a 1¾-in. bore. The cylinders were made from steel tubing, which was rolled to size, allowing 0.018 in. of stock for broaching. This entire amount of stock was removed in one pass of the broach, finishing the bore to size. As the limits on the diameter of the hole were very close, with specifications that the hole must be absolutely straight, three drift bearings were required on the broach to prevent the broach from drifting during the broaching operation.

In Fig. 10 is shown the same broach that was shown in process of being turned in Fig. 1. This broach is 64 in. long overall, has six splines for splining a countershaft gear, and is made of high speed steel.

When the use of special broaching fixtures will aid in obtaining the maximum of production, such fixtures can be designed and furnished by the Krueger Division of this same company.

Fig. 8—A sectional broach, consisting of a holder in which are located six high speed steel broach sections. Fig. 9—A special broach of the "non-drift" type. Fig. 10—This 64-in. overall length six-spline high speed steel broach is the same broach that was shown in the rough in Fig. 1.



New!

Now ready—Catalog "H"

The new BARBER-COLMAN Book of Small Tools

We now have ready for mailing Catalog "H" —the new Barber-Colman Book of Hobs, Milling Cutters and Reamers. This 200-page catalog is an entirely different edition than Catalog "G" which it supersedes. It contains not only illustrations and descriptions of all Barber-Colman Small Tools, but also illustrates and describes Barber-Colman Hobbing Machines, Hob Sharpening Machines and Reamer Sharpening Machines. It supplies in handy, convenient form a wealth of valuable information on Hobs, Reamers and Milling Cutters—the hobbing process—data on Spline Shafts —and many valuable formulas and tables.

Your copy of this book will be forwarded promptly upon receipt of your request. Use the handy coupon below, if you wish. Simply fill out, clip and mail this coupon to us and your copy of Catalog "H" will go forward by return mail.

BARBER-COLMAN COMPANY
General Offices and Plant
ROCKFORD, ILLINOIS, U. S. A.

BARBER-COLMAN COMPANY M. S. 8-31
ROCKFORD, ILLINOIS, U. S. A

Please send me a copy of your new Catalog "H" describing Barber-Colman Hobs, Milling Cutters and Reamers.

Name_____ Firm_____

Address_____

City_____ State_____

Modern Milling Methods

By WM. K. ANDREW
Production Service Engineer, Kearney & Trecker Corporation

THE development, during the past few years, of mechanically-operated fixtures and power attachments has broadened the scope of the milling machine considerably. Tasks that formerly were considered impracticable are now handled with ease, due to improvements in the design of the machines and to the application of modern tool practice.

Tool design has always played a prominent part in the production of quantity outputs. Refinements, improvements, and the application of new principles, however, have enabled the evolution of methods by which a larger return on the machine investment is made possible. Every shop manager considers it his task to produce the maximum volume of machined parts per man per day, and up-to-date practices are of paramount importance in attaining this achievement. Any small fraction of time that can be saved on a milling operation, where the volume is large, mounts to a saving of no small magnitude by the end of the year.

In this article are included a number of descriptions of milling fixtures and attachments by which not only is the production time reduced to the minimum, but the high quality is maintained with less effort. Such a job is shown in Fig. 1. Here is shown a set-up for the milling of threads at the center section of the small crankshafts shown in Fig. 2. The equipment is made to hold and machine two shafts at one setting, a special two-

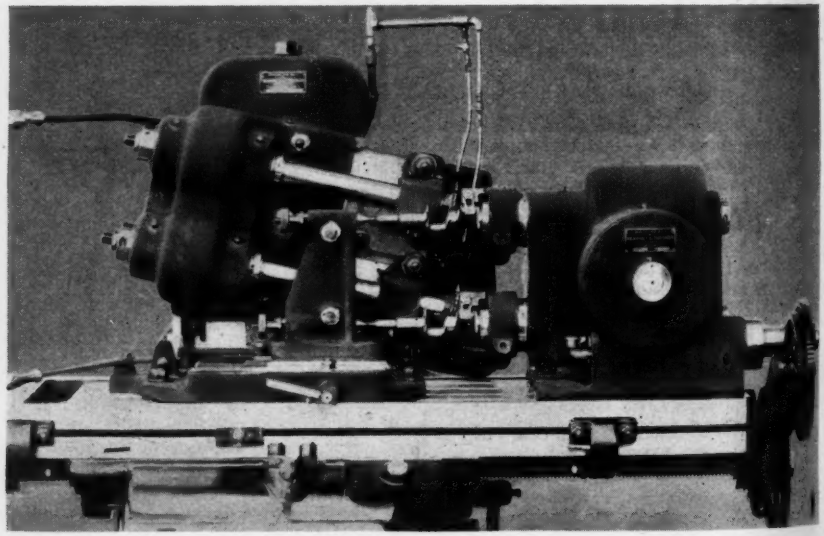


Fig. 1—Milling threads in the center section of the crankshafts shown in Fig. 2.

spindle head being used to drive the work. The head is geared to the feed-screw of the machine-table so that the rotation of the work and the horizontal feed are automatically timed.

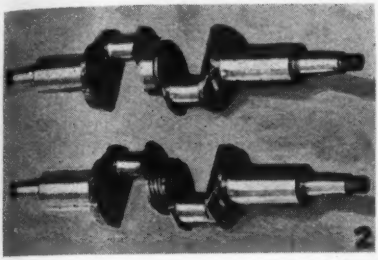


Fig. 2—Note thread in center section of lower shaft.

A two-spindle milling attachment is mounted to the column of the machine, each spindle having individual adjustment to allow compensation for cutter wear. In operation, the operator loads two crankshafts in the fixture, clamping them to the head and adjusting the centers at the opposite end as shown in Fig. 3. The crossfeed is then operated by hand until the cutters have entered the work to a predetermined depth, at which position the table feed is engaged. When the milling of the thread has been completed, the machine automatically stops.

In Fig. 4 is shown the operation of slotting lever forks to be used in the construction of refrigerating units. The fixture holds two pieces and is of the automatic type, being self-operated, independent of the machine. In other words, the machine table is locked in a permanent position and the feed is attained by means of a mechanically-operated slide. The pieces are automatically clamped, the sliding section of the fixture, which is arranged to hold the forks, being provided with two hinged clamps. The heels of the clamps are operated by plungers that are cam-actuated. When the sliding member of the fixture is moved to cutting position, cams located in the base casting cause the plungers to raise, thus, in turn, elevating the heels of the clamps and causing them to grip the work. The slide is automatically operated by means of a large drum cam located in the housing at the right end of the table. One revolution of the drum cam causes the slide to complete a cycle from left to right, which is the feeding motion, and from right to left, which is the rapid traverse used to bring the work to loading position.

The drum cam is driven by worm gearing through the feed shaft of the machine. The only duties of the operator, therefore, are to withdraw the finished forks and load the fixture with unfinished pieces. The drive to the drum cam is provided with a clutch so that the feed of the slide can be disengaged independently of the machine. Automatic fixtures of this type have a broad use, and will be found valuable in connection with the mill-

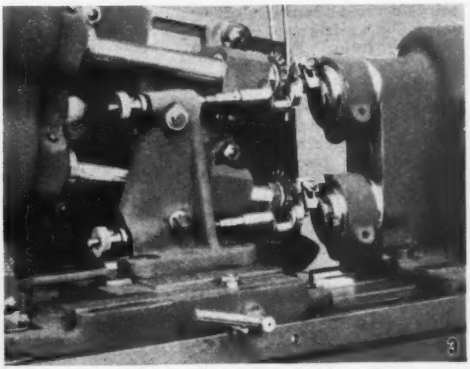
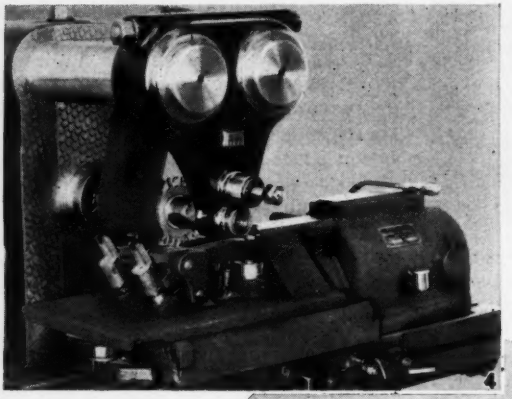


Fig. 3—Close-up view showing thread-milling set-up.

ing of miscellaneous small units in quantity lots.

In Fig. 5 is shown a tractor manifold, three surfaces of which are finished with the equipment shown in Fig. 6. The shape of the part necessitates having the work-holding sections of the fixture mounted in such a way that it can be withdrawn from the cutters and thus allow ample clearance for removal and loading of the work. This action is made possible by the pivoting of this section of the fixture at one end so that it can be swung out of the way. After a piece has been loaded and swung into cutting position, the swinging fixture section is locked in place by means of a U-slot and stud.

The manifold is located from a previously-milled surface, and is clamped by means of double-hinged clamps that are operated by handwheels at the front of the swinging fixture. After the piece has been clamped and swung into cutting position, the end clamps are adjusted so that the work is securely supported. The three surfaces on the piece are finished simultaneously by means of a special three-spindle head, mounted on a standard horizontal machine. Each spindle is provided with individual adjustment to compensate for cutter-wear. There is much to be gained by the use of multiple-spindle heads. In this particular case the use of multiple spindles permits three operations to be completed at one setting, thus reducing handling and increasing the production.



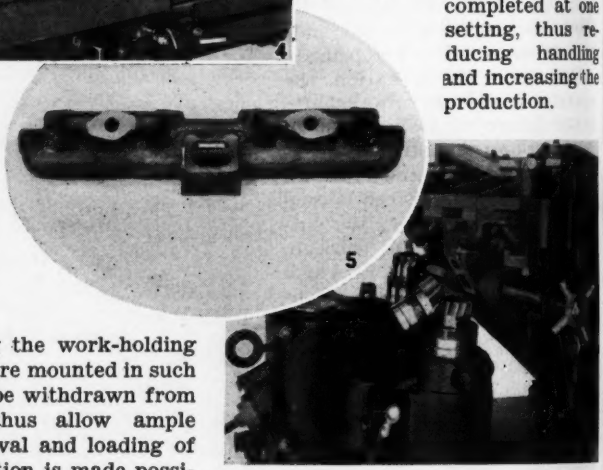
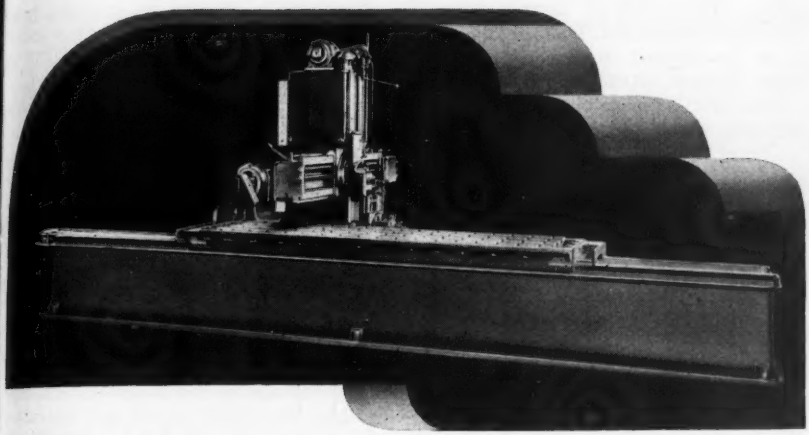


Fig. 4—An automatic, self-operated fixture for milling refrigerating unit forks. Fig. 5 — Tractor exhaust manifold, showing three finished surfaces. Fig. 6—Set-up for milling three surfaces on the tractor exhaust manifold shown in Fig. 5.

In Fig. 7 are shown two shock absorber brackets, one of which has four slots in the shank. The operation of milling the slots is performed with the equipment shown in Fig. 8, consisting of an indexing-type fixture that is arranged to hold four pieces on a milling machine with a special head in which four spindles are arranged in



A Statement and an ANNOUNCEMENT

Pioneering in its field, the Rockford Hy-Draulic Shaper Planer, illustrated above, is an outstanding successful machine-tool development. Not only does it reduce costs by increasing the productive capacity of the operator—it cuts down overhead by removing much more metal per horsepower, shortening set-up and operating time, lengthening the life of cutting edges, and in other ways. The successful application of hydraulic power to table-drive and feeds is responsible for this increased efficiency and output.

Several years of research and development preceded the introduction of the Hy-Draulic Shaper-Planer. Continuation of this work; study of the Hy-Draulic Shaper-Planer in commercial service, and our 25 years experience in building high grade mechanically driven shapers; now results logically in the announcement of

The Rockford Hy-Draulic SHAPER

Now in production. New throughout. Has hydraulic ram-drive and hydraulic feeds. *Compared with all-mechanical shapers, the Rockford Hy-Draulic has greater efficiency; uniform and much higher tool pressure; faster return; greater convenience; longer tool-life; lower operating cost—and a very attractive purchase price. Complete details supplied promptly—write for them today.*

ROCKFORD MACHINE TOOL CO.

. . . LATHES SHAPERS . . SHAPER-PLANERS

ROCKFORD, ILLINOIS, U. S. A.

pairs. The work is located from a previously-machined bottom face, and is so positioned in the fixture that chips cannot interfere with location.

The first pair of cutters mills two opposite slots in the shank of the

Fig. 7—Shock absorber brackets, in which four keyway slots are milled as shown at the right.

bracket, then the fixture is indexed 90 deg., bringing the piece into position over the second pair of cutters and locating a new piece over the first pair. The second pair of cutters is located at right angles to the first pair. As the fixture feeds downward again, the second pair of slots is milled in the piece. Thus, when the fixture is fully loaded, a completed piece is turned out at each cycle, which includes a cutting feed in which the fixture travels downward, and a rapid traverse as the fixture is elevated to neutral position. The fixture, incidentally, is arranged to hold a variety of sizes, which is accomplished by manipulation of the spacing collars shown on the clamping studs.

Chips fall into a trough that is cast integral with the fixture casting, the trough being inclined so that the chips will pass out at the right hand side of the machine. At the front of the fixture can be seen the indexing plunger which is withdrawn when the fixture is to be indexed. An outstanding feature of this set-up is the provision for vertical feed in both directions. Power is supplied from the feed shaft of the machine, which is coupled directly to the drive shaft of the fixture. After the fixture has been indexed, a clutch is engaged, by means of a lever, thus starting the downward feed. When the cut is finished, the feed clutch is automatically disengaged and a rapid return clutch is engaged, thus returning the fixture to neutral position. The operator then indexes the fixture and proceeds with another cycle. Loading is done while the cut is in process, so that the cutting is almost continuous.

The development of the modern types of air-operated devices has simplified the construction and operation of milling fixtures to a large degree. In Fig. 9 is shown one of a pair of fixtures for straddle-milling the ends of connecting rods for tractor engines.

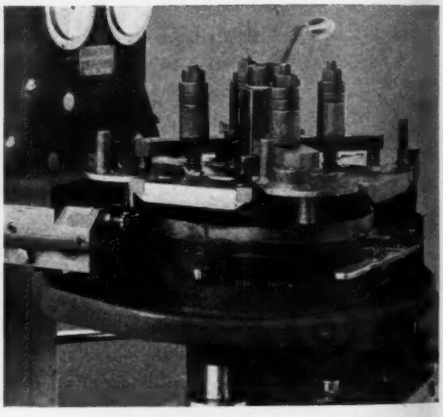
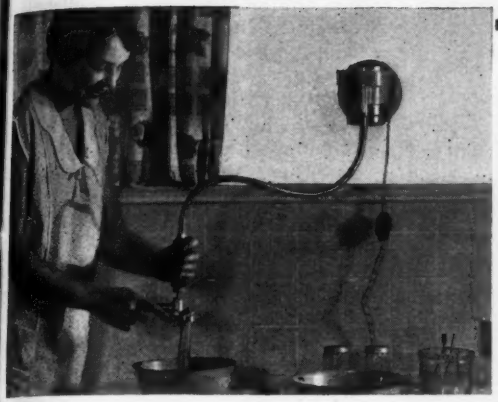


Fig. 8—Two sets of two cutters each operate simultaneously, producing a finished piece at each cycle.

The machine is a Mil-Waukee-Mil of the Simplex type, equipped with an auxiliary opposed head. Two sets of spindles are located opposite each other, as shown, the upper pair of cutters milling the wrist-pin end of the rod while the lower pair of cutters machine the faces of the crankshaft end. Both fixtures are air-operated,



Meet the
WIFE-SAVER

—a neat, handy, safe, labor-saving kitchen appliance. Reliability in the shaft is of course very essential. It is assured by the use of S. S. WHITE Shafts.

S. S. WHITE FLEXIBLE SHAFTS
make devices like this practicable

THIS housewife is happy with her WIFE-SAVER, product of the SpeedWay Mfg. Co., of Cicero, Ill. It's so neat and simple and takes the drudgery out of so many kitchen tasks.

Best of all, it never gives her any trouble. The manufacturer made sure of that by equipping the WIFE-SAVER with S. S. WHITE Flexible Shafts—shafts that have long been noted for their high quality and unfailing reliability.

The WIFE-SAVER is only one of many recently developed machines and devices which the reliability of S. S. WHITE Shafts has made practicable. More and more, designers and manufacturers are beginning to realize the possibilities of flexible shafts and are capitalizing on them.

Read the partial list of existing applications of S. S. WHITE Shafts. It will give you some idea of the broad scope of possibilities and will undoubtedly suggest many other desirable applications for which the flexible shaft is ideally suited.

Standard S. S. WHITE Drive Shafts ranging from the light .041" size to the powerful ¾" diam. shaft, together with a wide variety of couplings and casings, meet the requirements of practically any application. At the same time the Company is equipped and prepared to make special shafts to suit specific requirements.

Complete data on S. S. WHITE Shafts will be furnished on request. Full and capable engineering co-operation is also offered for the working out of any unusual application. Inquiries are invited. Address them to

The S.S.WHITE Dental Mfg. Co.
INDUSTRIAL DIVISION
150A WEST 42ND STREET • NEW YORK, N. Y.

PARTIAL LIST OF APPLICATIONS, S. S. WHITE FLEXIBLE SHAFTS

MACHINES
Valve Grinding
Screw Slotting
Milling
Glass Cutting
Testing
Portable Grinding
Concrete Surfacing
Paint Scraping
Floor Scraping
Engraving
Shoe Making
Animal Shearing
Hair Clipping
Massaging
Washing
Linotype
Printing Presses
Jewelers' Lathes
Surgical Engines
Dental Engines

MISCELLANEOUS
Aircraft Radio
Automobile Radio
Boiler Tube Cleaners
Tachometers
Speedometers
Counting Attachments
Taximeters
Indicators
Moving Picture Cameras and Projectors
Odometers
Gun Fire Controls
Valve Controls
Searchlight Controls
Engine Governors
Windshield Cleaners

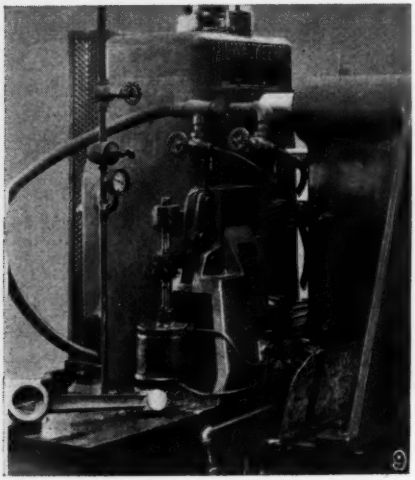


Fig. 9—Air-operated fixture for holding connecting rods while the ends are straddle-milled.

and are arranged so that the work can be changed on one fixture while the other is in process. The construction of the fixture is clearly shown in the tool assembly drawing, Fig. 10.

The air cylinder **A**, which is 4 in. in diameter, is attached at the rear of the fixture casting so that it can be used to actuate the plunger vertically. On the plunger is located the yoke **B**, which engages the toggle **C**. This toggle operates the clamp **D** through the link **E**. The clamp is of the swinging type, hinged on the pin **F**. When the heel end is elevated by means of the toggle and link, the clamping end, made in the form of a V-block, grips the small end of the connecting rod. The large end of the rod is located by a stationary V-block, while the locating block **G** aligns the work from the channeled section. By changing the clamp and providing a stationary V-block of different design, the fixture will handle rods of different sizes, as shown by the example at the left end of the drawing.

Another air-operated fixture is shown in Fig. 11, which illustrates a set-up for milling a key-slot in clutch housings that are used in automatic washing machines. The fixture is arranged to hold two pieces, which are clamped together by the single air cylinder shown at the left end of the table. The operation of the cylinder is automatically controlled in relation to the table travel by means of trip levers that open or close the air valve at predetermined positions. The duties of the operator are thus limited to removing the work after it has been milled, replacing with two new pieces, and engaging the feed lever of the machine.

In Fig. 12 is shown an application of the automatic type of fixture, with

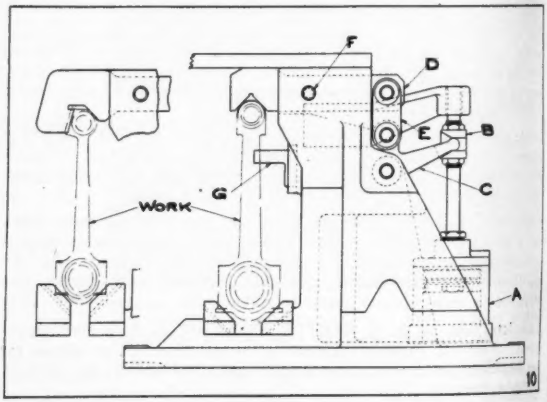


Fig. 10—Drawing showing construction of connecting rod fixture.

which an air cylinder is used to clamp the work. The workpiece is an aluminum vacuum cleaner casting, the walls of which are required to be finished on

2,429 *Avey* Users

are profitably operating

45,123 *Avey* Spindles

What's Your Problem? Mail the Coupon

THE thousands of AVEY Spindles . . . being used in plants ranging from the large industrial leaders down to the small job shops . . . are ample proof of AVEY Dependability to reduce costs and increase production under all conditions.

And, there is a standard AVEY machine that is well adapted to your needs on any drilling, reaming, or tapping job from 0 to 1¼". SINGLE OR MULTIPLE units, many sizes and types to suit varying conditions . . . each machine equipped with ball bearings throughout . . . capable of doing accurate work for a long time to come.

Submit your problem to AVEY Engineers. Let them make a suggestion . . . without obligation. Use the coupon.

THE AVEY DRILLING MACHINE CO.

CINCINNATI, OHIO

We are interested in drilling machines for the following work.....

.....

Name.....

Firm.....

Address.....

City and State.....

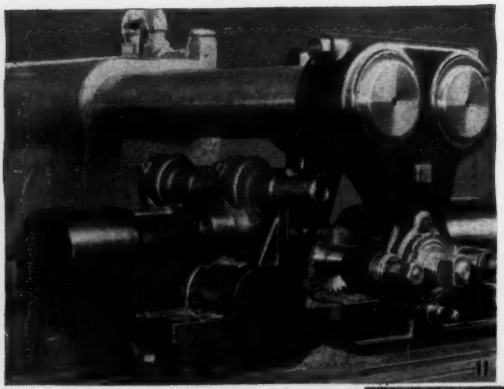
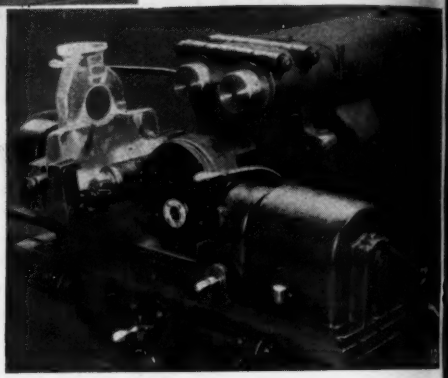


Fig. 11—Air-operated fixture used in milling key-slots in clutch housings.
Fig. 12—Using an air-operated fixture and special head to mill vacuum cleaner castings.

hardened plates, and is held in place by a clamp attached to the plunger of the air cylinder at the left end of the table. On this operation, also, the operator is required only to load and unload the fixture, since the feed motions are entirely automatic. The work-holding slide is drawn from left to right by means of a drum cam and roller, during which movement the opposite inside faces of the work are milled



the interior at either side. For this operation a special head is employed, having a spindle which projects horizontally beyond the driving housing and carrying a cutter at each end. Thus both walls are milled at the same time, and as the cutters are set for the correct over-all dimension, accuracy is assured without the necessity of gauging. The piece is located against

The slide is then returned to neutral position for reloading.

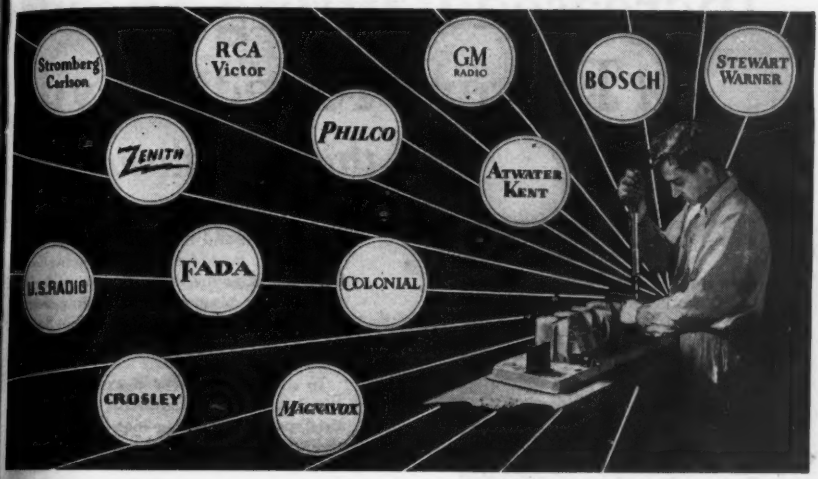
Eclipse Counterbore Company Catalog No. 32

All of the "Eclipse" High Production End-Cutting Tools and Holders made by the Eclipse Counterbore Company, Detroit, Michigan, are described and illustrated in Catalog No. 32, which has been published by this firm. The text includes descriptions and illustrations of "Eclipse" counterbores, spot facers, two-piece core drills, multi-diameter cutters, countersinks, hogging cutters, end form cutters, die sinking cutters, adjustable high speed steel insert centers, adjustable length holders, and special tools. Two of the outstanding additions to this catalog are the Eclipse integral solid pilot counterbore and the two-piece core drill. These tools are stocked in all popular sizes.

The book contains 112 pages, 6 x 9 in. in size. Besides the usual illustrations of the tools that are described, a number of full-page illustrations are included showing, at close range, the tools in actual operation on various kinds of jobs. Views of the various departments of the plant are also shown, thus giving the reader an idea of the size of the plant and the modern lines upon which it is operated.

A copy of this catalog can be had by any machine shop executive who will address his request on his firm's letterhead.

THE RADIO INDUSTRY DEMANDS ASSEMBLY SPEED, ECONOMY AND SECURITY



Leading manufacturers obtain all with Self-tapping Screws

Build fifty thousand sets in thirty days! Such an order is not unusual in a great radio manufacturing plant. Each improvement in radio design, every buying season, sends production skyrocketing overnight. Speed is the password of radio production. Speed to meet delivery schedules. Speed to meet cost schedules, too.

To attain rapid, uninterrupted work along the assembly line, leaders in the radio industry use Self-tapping Screws. By experience they know that these unique Screws offer the simplest, easiest way of making the many fastenings required in the assembly of each receiver. In a year's production of the Famous Philco Balanced Unit Radio, more than twenty-seven million tapping operations are eliminated by Self-tapping Screws. Radio assemblies made so much quicker and cheaper, are also stronger. Scientists have proved that fastenings made with Self-tapping Screws hold better than machine screws or bolts and nuts under tension, shear and vibration stresses.

Whether you produce ten or a thousand units a month... if your product requires metal assembly, Self-tapping Screws probably will reduce your fastening time and costs. Find out. Our Assembly Engineers will gladly and honestly tell you whether you can use Self-tapping Screws to advantage if you attach a description of one or more assemblies to the coupon below. You will find the two free booklets shown below worth careful reading... be sure to get them.

Hardened Self-tapping Sheet Metal Screws

For joining and making fastenings to sheet metal up to six gauge, also aluminum, die castings, Bakelite, etc. Simply turn Screw into drilled, pierced or molded hole. It forms a thread in the material as it is turned in. Can be removed and replaced

Type "U"—Hardened Metallic Drive Screws

This type of Self-tapping Screw is used for making permanent fastenings to iron, brass and aluminum castings, steel, Bakelite, Durez, etc. Just hammer the Screw into a drilled or molded hole. It forms a thread in the material as it is driven.

PARKER-KALON *Hardened* Self-tapping Screws

PAT. IN U. S. AND FOREIGN COUNTRIES

← 14 Unbiased Reports on Savings ---------- Scientists Explain Fastening Security →

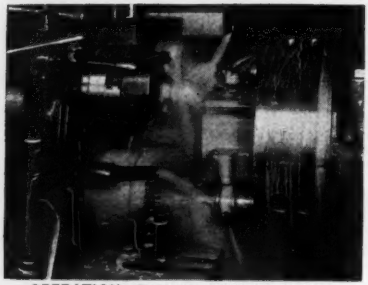
PARKER-KALON CORPORATION, Dept. E, 190-196 Varick Street, New York, N. Y.

Send me free booklets on the Security and Economy of assemblies made with Self-tapping Screws.

Name and Co ----------

Address ----------

Increased Cutting Speeds, *and* Fewer "Rejects" with *of the Cleveland Steel*



Courtesy of Cleveland Steel Products Corporation, Cleveland, Ohio

OPERATION: TURNING, DRILLING, FACING AND REAMING 3½ IN. FLANGE FOR UNIVERSAL JOINTS.
MACHINE: CLEVELAND 8 IN CHUCKING MACHINE.
MATERIAL: S. A. E. 1035 STEEL
SPINDLE SPEED: 106 R. P. M.
PRODUCTION: 25 PIECES PER HOUR.
LUBRICANT: 1 PART SUNOCO TO 12 PARTS WATER.

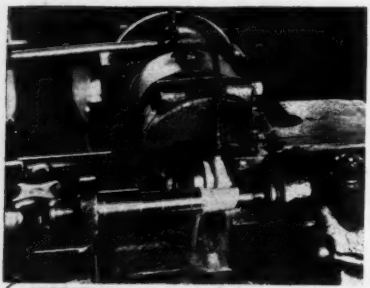
Self-evident and definite advantages accompany the use of Sunoco Emulsifying Cutting Oil. Whether the work be turning, forming, reaming, hobbing, milling, grinding or one of many other difficult operations—Sunoco's service record testifies definitely to the complete satisfaction given.

In shops all over the country, every working day, Sunoco is materially increasing cutting speed, prolonging tool life, appreciably reducing the number of rejections and minimizing "time out for repairs".

If you are not already a Sunoco user, may we suggest a thorough test under your most exacting operating conditions?

This will enable you to see for yourself these advantages.

We invite you also to check its long-lasting and non-separating qualities, its properties as a refrigerant and lubricant, the larger quan-



Courtesy of Cleveland Steel Products Corporation, Cleveland, Ohio

OPERATION: MILLING THREAD ON 1⅛ IN. SPLINE SHAFT 20 THREADS.
MACHINE: LEES BRADNER THREAD MILLER.
MATERIAL: S. A. E. 3135 STEEL.
CUTTER: 3 IN. R. P. M. 156.
PRODUCTION: 30 PIECES PER HOUR.
LUBRICANT: 1 PART SUNOCO TO 15 PARTS WATER

SUN OIL COMPANY, Philadelphia, U.S.A.

SUN
EMULSIFYING
Made by SUN OIL CO. *producers*

Akron, Albany, Allentown, Atlantic City, Baltimore, Battle Creek, Columbus, Dallas, Dayton, Detroit, Flint, Grand Rapids, Harrisburg, Philadelphia, Pittsburgh, Providence, Reading, Rochester, Scranton, Syr-

Prolonged Tool Life SUNOCO *at the plant*

Products Corporation

tity of metal removed per tool grind, the smooth finish to completed part and the absence of rust and corrosion after the part has been in stock for some time.

These observations will serve as an adequate explanation as to just why Sunoco receives the whole-hearted endorsement of so many leaders in the metal cutting industry.

We cordially offer you the assistance of our engineers in securing full benefits from Sunoco. These representatives are widely experienced and their services are at your disposal. Write to any of our branches or to our home office.

The Sun Oil Company produces a type of cutting oil to meet every metal-cutting requirement.

SUNOIL COMPANY, Ltd., Montreal, Canada.

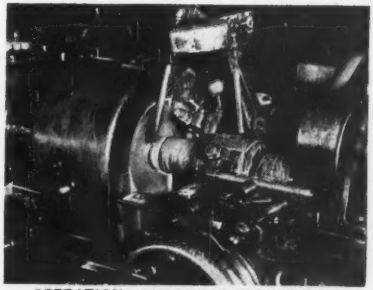
SUNOCO

CUTTING OIL

of BLUE SUNOCO MOTOR FUEL

Beaumont, Bridgeport, Buffalo, Chicago, Cincinnati, Cleveland, Jackson, (Mich.), Jacksonville, Miami, Montreal, Newark, New York, Syracuse, Tampa, Toledo, Toronto, Trenton, Tulsa, Wilmington, Youngstown.

Courtesy of Cleveland Steel Products Corporation, Cleveland, Ohio



OPERATION: GRINDING BLEND HOLE IN UNIVERSAL JOINT PIN
MACHINE: HEALD 72 A 3 SIZEMATIC INTERNAL GRINDER.
MATERIAL: NO. 1525 STEEL
PRODUCTION: 150 PIECES PER HOUR.
WHEEL: ¾ IN. X ½ IN. X ¾ IN. R. P M 16,500
LUBRICANT: 1 PART SUNOCO TO 50 PARTS WATER.

Courtesy of Cleveland Steel Products Corporation, Cleveland, Ohio

OPERATION: GRINDING STUB SHAFT BEARING SURFACE.
MACHINE: NORTON 10 X 8 TYPE A GRINDING MACHINE.
MATERIAL: S. A. E. 3135 STEEL.
WHEEL: 20 IN. R. P M. 1100
PRODUCTION: 75 PIECES PER HOUR
LUBRICANT: 1 PART SUNOCO TO 50 PARTS WATER

Conveyor At General Electric Plant Makes One Building Out of Eight

EIGHT separate buildings in the Schenectady plant of the General Electric Company are combined into one large manufacturing shop by means of a conveyor that is approximately a mile long. This conveyor, of all-welded construction and practically automatic in operation, is believed to be the longest conveyor of its type in the world.

When the manufacture of electric refrigerators was first undertaken at the Schenectady plant, operations were confined to a few neighboring buildings. As production increased, other buildings, of as close proximity as possible, were taken over by the refrigerator division, until eight buildings, scattered over a considerable space, were involved in the manufacture of this product. Up to this time materials had been handled between buildings and departments by means of tractor-and-trailer trains, lift trucks and skids, and gas and electric trucks. These methods resulted in delays, spoilage, and so on. Thus it was eventually found necessary to devise a means of bringing the buildings—in effect—closer together, due to the fact that no one building was large enough.

Accordingly, an automatic conveyor was installed, following the course outlined in the illustration, Fig. 1. The

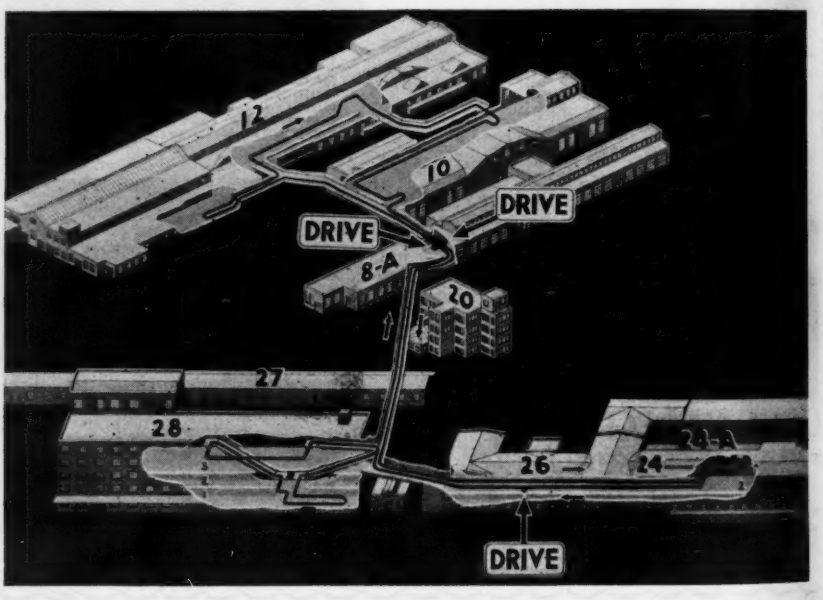


Fig. 1—Drawing showing path of conveyor through the various buildings served.

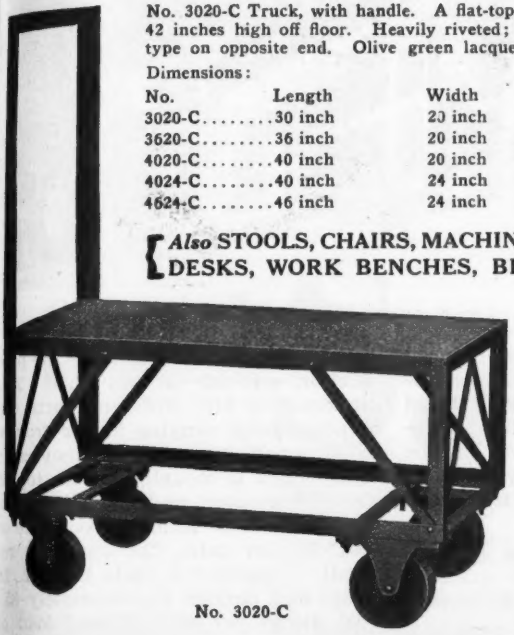
All-Steel Trucks *FOR EVERY SHOP PURPOSE!*

No. 3020-C Truck, with handle. A flat-top truck 18 inches high, with handle 42 inches high off floor. Heavily riveted; swivel casters one end, stationary type on opposite end. Olive green lacquer finish.

Dimensions:

No.	Length	Width	Casters	Bed Plate
3020-C	30 inch	20 inch	4 inch and 5 inch	16 gauge
3620-C	36 inch	20 inch	5 inch and 6 inch	12 gauge
4020-C	40 inch	20 inch	5 inch and 6 inch	12 gauge
4024-C	40 inch	24 inch	5 inch and 6 inch	12 gauge
4624-C	46 inch	24 inch	5 inch and 6 inch	12 gauge

[*Also* STOOLS, CHAIRS, MACHINE TENDERS, CABINETS, DESKS, WORK BENCHES, BINS, TABLES, of Steel.]



No. 3020-C

No. 24-24-40 Box Truck—40 inches long, 24 inches wide, 24 inches deep. Overall height: 33 inch angle frame, 16 gauge box. Riveted construction.

No. 3020-F Closed-Side Truck—15 inches deep in box part, 16 gauge. Height overall 35 inches. Riveted construction. Other sizes to choose from.

No. 48-24-50 Open-Side Truck—Bed 10 inches off floor. Loading space 40 inches high, 48 inches wide, 24 inches deep. Overall height 50 inches.

No. 24-24-40

No. 3020-F

No. 48-24-50

Write for complete catalog C-MMS and price list of over thirty stock patterns of all-steel trucks, or built special for you.

ANGLE STEEL STOOL CO.

PLAINWELL, MICHIGAN

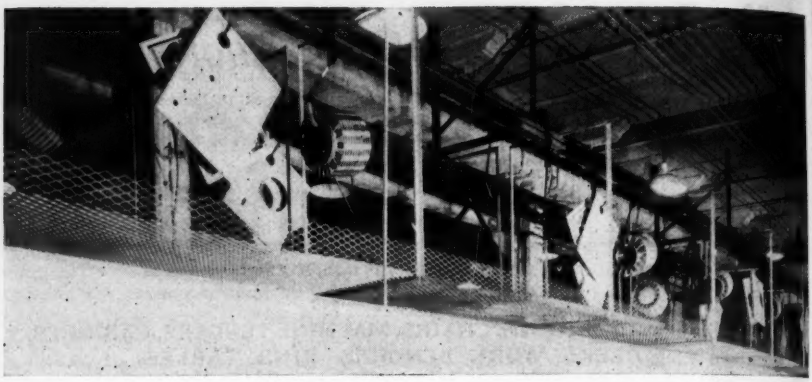


Fig. 2—Typical section of the conveyor.

use of this conveyor has reduced handling costs, reduced spoilage, released valuable floor space, reduced the cost of repairs to handling equipment, eliminated confusion in the aisles and consequent delays, eliminated time lost in waiting for stock, and reduced inventories.

There are twelve loading and unloading stations in the eight buildings served, and material can be distributed

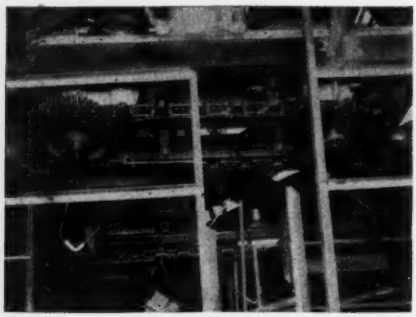


Fig. 3—One of the driving points of the conveyor, showing full-floating, dual caterpillar drives, with automatic adjustment.

to any point on the system from any other point. A considerable latitude in speed variation is possible—from 15 to 45 feet per minute—allowing the rate of flow to be adjusted to the production schedule at any time. Approximately fifty different parts are handled daily, ranging in size from a small wood screw to the compressor unit, which is mounted on the top of the refrigerator, and in weight from one ounce to 75 pounds. At a rate of 26.6 ft. per min., the conveyor recently completed a cycle in 2 hr. 18 min., and carried approximately 85,000 pieces per day, a total load of about 85 tons.

The conveyor is electrically driven and power is applied from three different points along the route, these points being selected to provide an equal distribution of load. A special speed-synchronizing system is employed, allowing the use of standard motors without difficulty from variation in speeds.

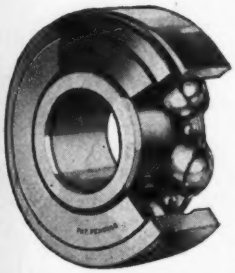
What is said to be the most elaborate safety system in the world is used to safeguard both the conveyor and the employees. Safety devices include control switches, guards, signal horns, and so on. In case of accident, the conveyor may be stopped instantly by means of push buttons conveniently located at all loading and unloading stations. The conveyor is not re-

(*Continued on page* 81)

Simplify- and Save!

With this new . . . . .

PRECISION BEARING



ELIMINATES closure caps – cuts out machining of outer housing face—does away with drilling, tapping and machine screws – reduces machining operations – speeds up assembly – cuts mounting costs.

Self-contained – felt-sealed – dust-and-dirt-proof – grease-packed, with a larger grease capacity—all-steel, with a one-piece outer ring.

Write for the "Greaseal" Data Sheets.

"GREASEAL"

FELT – PROTECTED

NORMA-HOFFMANN BEARINGS CORPORATION STAMFORD, CONN., U.S.A.

Arc Welding In the Locomotive Boiler Shop, II

The "Back Step" Method of Welding a Seam In a Firebox—Relieving the Strains

By JAS. M. VOSSLER
Welding Supervisor, Southern Pacific Lines, Houston, Texas

IN WELDING a seam in a firebox, the method known as the "back step" method should always be followed. This method is illustrated in Fig. 7. In following this method of welding, the welder first ties the space to be welded at point No. 1. About a half-inch tie is sufficient. He then goes to point No. 2, about 5 or 6 inches distant, and welds to point No. 1, as indicated by the arrow. When this section is completed, he will then start at point No. 3 and weld to point No. 2, and so on until the entire seam from No. 1 to No. 6 is completed. It might here be added that, should it be desired to weld two loose plates by this method, it will be necessary to tie the seam at each end, and then in between at points about twenty or thirty inches apart.

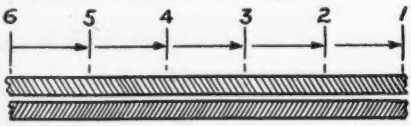


Fig. 7 — Diagram illustrating "Back Step" Method of Welding.

The above instruction covers welds approximately 20 to 30 in. long. For long welds, such as those made in welding side sheets in fireboxes, the seams should be tied at each end as shown in Fig. 8. Then the contacting edges should be tied at points from 20 to 30 in. apart, such as point No. 0 and point No. 5. For the sake of simple explanation, the seam shown in Fig. 8 is assumed to be 72 in. long. Thus the two intermediate ties will divide it up into three sections, each of which will be 24 in. long, and shown as sections "A," "B" and "C." The back steps are 6 in. long.

The proper way to handle the weld will be to back step each section, and to back step the sections with respect to each other. To do this, the welder should start welding at point No. 1, and progress to point No. 0, as indicated by the arrow. Next start at point No. 2 and weld to point No. 1, and so on until section "A" is completed. After this, section "B" should be welded in a similar manner, by starting at point No. 6 and welding to the tie at point No. 5, and completing the section as described above. After section "B" is completed the welder should move to section "C" and follow the same method of procedure.

In order that the reader may completely understand the advantages of back stepping and of tieing the welds, the diagrams, Fig. 9 and 10, have been prepared. Let us consider Fig. 9 first. The horizontal line represents the length of the seam in inches and corresponds to the seam shown in Fig. 7. The length of the vertical lines represents the value of the strains accumu-

lated in the weld as the welder progresses with his work, and would be expressed in pounds.

For the sake of simplifying the explanation, let us assume that each of the horizontal light lines represents 5,000 lb. strain. Then the strain at "Z" would be 5,000 lb., that at "Y" would be 10,000 lb. and so on, until the

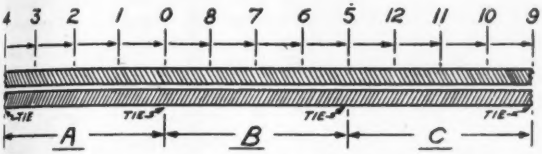


Fig. 8—Long welds should first be tied at each end and at points from 20 to 30 inches apart.

strain accumulated at "T" would be 25,000 lb. The angle of the sloping line represents the rate of increase of the strain as the weld progresses. Now let us consider jointly Fig. 7 and Fig. 9. Let us consider that the welder starts to weld at point No. 6 and continues to point No. 1, which he would do if it were not necessary to make allowance for contraction. As he progresses the strain accumulates in proportion to the distance, as the weld progresses from the starting point.

Thus at point No. 5, on the seam, he would have accumulated a strain represented by the length of the line Z-5 or 5,000 lb., at point No. 4 a strain in proportion to the line Y-4 or 10,000 lb., and so on until the weld is completed at point No. 1, on the seam, at which point he would have accumulated a strain in proportion to the line T-1, which would have a value of 25,000 lb., since it is five 5,000-lb. spaces in length. Now if the weld metal has an ultimate breaking strength of 50,000 lb. per square inch, this weld will hold so long as it does not receive a load which, when added to the strain at the point of the load, will exceed the ultimate breaking strength. If the total does exceed the breaking strength, then the weld will break.

For example, let us consider a load of 40,000 lb. suddenly placed on the weld at point No. 3. By considering the diagram in Fig. 9, we see that the strain at point No. 3 is represented by the line X-3, which has the length of three 5,000 lb. spaces, and, therefore, a strain value of 15,000 lb. Then the total strain on the weld at point No. 3 would be the weld strain of 15,000 lb. plus the working load of 40,000 lb., or a total of 55,000 lb. This would be 5,000 lb. in excess of the ultimate breaking strength of the weld, and would cause the weld to start breaking at that point.

The cooling of the metal sets up contraction strains similar to those described above, which must also be compensated for. We can do nothing to completely relieve all strain in a firebox weld. We cannot take a strain-relieving heat on the finished weld as

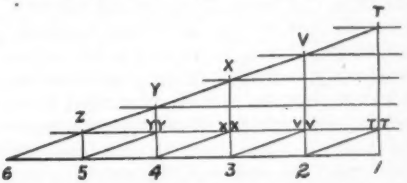


Fig. 9—Diagram illustrating Accumulation of Stresses in Welding.

we can with a locomotive frame weld, nor can we jack the seam apart to allow for contraction, but we can reduce the strain to a value sufficiently low that it will give us no trouble. This is done by the back step method described above, which method is the most successful known to the author.

Let us again consider Fig. 7 and Fig. 9. The procedure used to weld the seam shown in Fig. 7 by the back

step method is described above. Refer to the diagram shown in Fig. 9. When the weld is first started there is no strain at point No. 2, but as the weld cools, and the welder progresses, a strain is accumulated as indicated by the sloping line 2—TT until the point No. 1 is reached. The strain at this point is represented by the length of the line, TT—1, which is equal to 5,000 lb., according to the scheme of this diagram as described above. The strain at point No. 2 would be represented by the line VV—2, that at point No. 3 would be represented by the line XX—3, at point No. 4 by the line YY—4, and at point No. 5 by the line Z—5.

Since each of these lines covers one

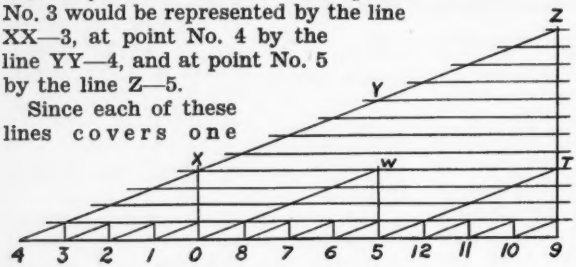


Fig. 10—Diagram illustrating Advantage of Tieing and Back Stepping a Long Seam Weld.

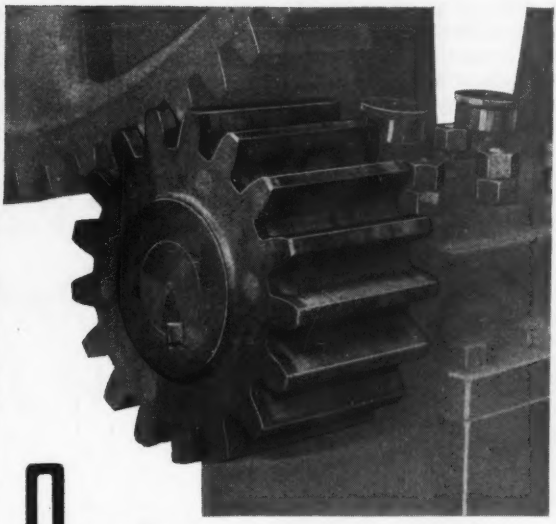
5,000 lb. space, each represents a 5,000 lb. strain, which strain is the maximum in the weld. Thus, it can clearly be seen that by the back step method, the strain that is locked up in the weld is greatly reduced; in fact, reduced to a point that is, for all practical purposes, negligible. (The writer wishes to make it clear that figures used to represent the value of the strain in the weld are only assumed in order to make the explanation easier to understand.)

In long seams, such as those made in applying side sheets to fireboxes, there is a tendency of the weld to warp the sheets, even though the back step method is used. This likewise is true when new fireboxes are being assembled by welding. Precautionary steps must be taken to prevent, or at least minimize, this warping action. The "cold strip" weld preparation described in the July issue, and illustrated in Fig. 3, is for such long welds as these, and the welding must be handled by the back step and tie method, also described above.

The diagram Fig. 10 was drawn to show the advantage gained by tieing and then back stepping the long seam weld shown in Fig. 8. As in Fig. 9, the solid horizontal line represents the length of the seam, and the vertical lines represent the value in pounds of the strain placed in the sheet by the contraction of the weld. As we did above, for the sake of explanation, we will assume that each light horizontal line represents 5,000 lb. strain. Should the welder start welding at one end, say at point No. 4, and continue to the other end of the seam without taking any precautionary steps to minimize the strain, it would accumulate as he progressed, and as represented by the increasing distance between the base line and the line 4—Z in Fig. 10. When he reached the end, shown as point No. 9, a strain would have accumulated as represented by the vertical line Z—9. This line is the length of twelve of the 5,000 lb. spaces, and therefore represents 60,000 lb. strain. Now if the back steps were made the length of sections "A," "B" and "C," Fig. 8, the strain would be reduced to a value represented by the lines X—0, W—5 and T—9, Fig. 10, all of which are equal in length. As shown in the diagram, each of these lines is four spaces long, and represents 20,000 lb. strain. Now by tieing and taking the short six-inch back steps, as outlined in the description of Fig. 8, the strain is reduced to a value represented by the short vertical lines shown in Fig. 10, and which are only one 5,000-lb. space in length. Therefore, the strain

FORMICA GEAR CUTTERS

The Akron Gear & Eng. Co.
Akron, Ohio
Farrell-Birmingham Co., Inc.
Buffalo, N. Y.
Slaysman & Company
Baltimore, Md.
Harry A. Moore, Bangor, Me.
The Union Gear & Mach. Co.
Boston, Mass.
The Atlantic Gear Works
Brooklyn, N. Y.
Chicago Rawhide Mfg. Co.
Chicago, Ill.
Perfection Gear Company
Chicago, Ill.
Chicago Gear Company
Chicago, Ill.
The Cincinnati Gear Co.
Cincinnati, Ohio
The Greaves Machine Tool Co.
Cincinnati, Ohio
The Horsburgh & Scott Co.
Cleveland, Ohio
The Stahl Gear & Mach. Co.
Cleveland, Ohio
The Master Electric Co.
Dayton, Ohio
The Adams Company
Dubuque, Iowa
The Ferguson Gear Co.
Gastonia, N. C.
Excello Machine Co.
Grand Rapids, Mich.
Hartford Special Machinery Co.
Hartford, Conn.
Precision Machine Co.
Milwaukee, Wis.
Joaquin Alemany Lopez
Havana, Cuba
Dolman Foundry & Machine Co.
Houston, Texas
Generating Gear Co.
Milwaukee, Wis.
Mobile Pulley & Machine Wks.
Mobile, Ala.
Berkley Mach. Works and
Foundry Co., Norfolk, Va.
Meiselbach-Catucci Mfg. Co.
Newark, N. J.
Sier-Bath, Inc.
New York City, N. Y.
E. M. Smith Machine Shop
Peoria, Ill.
The Earle Gear & Mach. Co.
Philadelphia, Pa.
The Pittsburgh Machine &
Supply Co., Pittsburgh, Pa.
Standard Gear Company
Pittsburgh, Pa.
Rodney Davis and Sons
Philadelphia, Pa.
The Turley Gear & Machine Co.
St. Louis, Mo.
Perkins Machine & Gear Co.
Springfield, Mass.
Winfield H. Smith, Inc.
Springville, N. Y.
Alling Lander Company
Sodus, N. Y.
Charles E. Crofoot Gear Corp.
South Easton, Mass.
Arlington Machine Co.
St. Paul, Minn.
Diefendorf Gear Corp.
Syracuse, N. Y.
Worcester Gear Works
Worcester, Mass.
Massachusetts Gear & Tool Co.
Woburn, Mass.



QUIETER MACHINES
-ARE EASIER TO SELL

Because Formica equipped machinery is easier to sell there has been a steady increase for years in the number of Formica gears used on machinery produced in quantity. Formica is non-metallic and quiet; it does not ring or grind. It is elastic and absorbs jars and jolts. It is inert chemically and can be used where fumes or spray would destroy many materials.

Silence in machinery is every day more prized. Maintenance men are always striving to make the machinery they control more quiet. They have been using Formica because it helps them to do their jobs well.

The next time you need a replacement gear, you will find that any of the firms listed can give you prompt service.

THE FORMICA INSULATION COMPANY
4640 Spring Grove Avenue Cincinnati, Ohio

FORMICA
Non-Metallic
GEARS

is reduced to a workable minimum.

The above description of seam welding covers in a general way the methods of handling the strains set up in welds by the contraction of the welds during cooling. The description, however, only covers seams, all of which are in a straight line. This is not the case with a good many welding jobs. One of the most complicated and difficult jobs to handle was the old style diamond pointed side sheet patch, as shown in Fig. 11. This form of patch is being abandoned to a large extent, and half side sheets applied in its stead. This move is due partly to the difficulty that is experienced in welding the patches, and partly to the fact that when a portion of the side sheet has become bad enough to need a patch, the rest of the sheet is weakened to such an extent that it will not last long enough to justify the cost of the patch. However, the diamond-pointed patch is a good example with which to illustrate a complicated firebox weld.

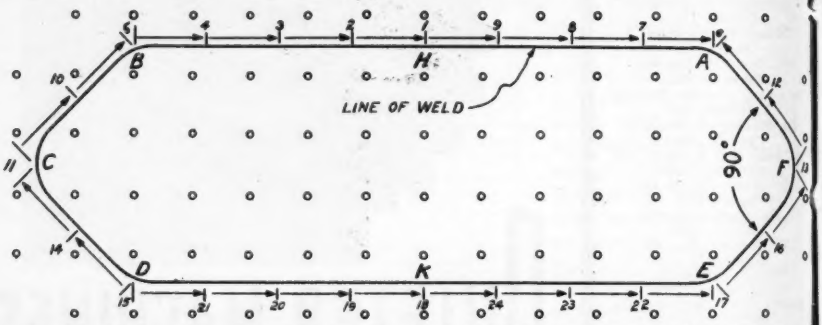


Fig. 11—Diagram illustrating Back Stepping Method of Welding a Diamond Pointed Patch.

In Fig. 11 is illustrated a diamond-pointed patch, the sides of which are assumed to be 40 in. in length, and the width 16 in. The angle of the points of such a patch should be ninety deg. It was first considered proper to tack-weld the patch about every 10 or 12 in. around the edge to hold it in place, but the error of this method soon became apparent. If the tack-welds were made light they would break on one side before the other side was completely welded, and if they were made strong enough to hold during the welding operation, trouble would generally be experienced with the weld after the engine was returned to service. It was necessary, then, to find some satisfactory means of holding the patch in proper alignment.

The best method that was found was to screw stay bolts through the outside wrapper sheet, near each corner of the patch, until they touched the rear of the patch. Machine bolts were then run through staybolt holes in the patch and wrapper sheet adjacent to the staybolts above-mentioned, and the nuts were tightened so as to pull the patch against the staybolts. It can then be plainly seen that by adjusting the machine bolts and stay-bolts, the patch can be easily placed and held in proper alignment with the side sheet.

In welding such a patch, one side should be welded completely and then allowed to cool until the bare hand can be held on it in comfort before the welding of another side is started. This permits the first weld to completely contract before the next one is started. Should one side of the patch be welded before the opposite side has

. . . . . Use this

"Standard Gage"

COMPARATOR

MODEL No. 105

On Your . . . . . .

Precision Work

IT IS the ideal comparator for all shops . . . built for production inspection, incorporating the finest in accuracy to meet the most exacting requirements.

The "Standard Gage" Comparator Model 105 is distinctive in design, rugged and durable in construction to insure a long life of efficient service. It is furnished with either the Model No. 2-X special indicator which gives readings in .0001" (.00005" can be estimated with ease) or with the Model X-2-X indicator which gives readings in .00005".

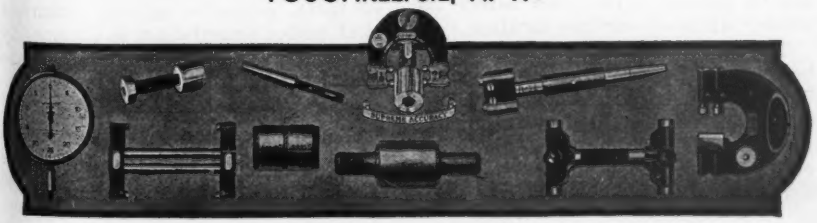
The many advantages, details of construction, and specifications of the New Model 105 are listed in a special bulletin. Send for it . . . study it . . . see how this new comparator will fit into your production and final inspection departments.

SEND FOR CATALOG

STANDARD GAGE CO.

INCORPORATED

POUGHKEEPSIE, N. Y.



sufficiently cooled, all of the strain of the weld of one side of the patch, plus most of the strain of the weld of the other side, will be locked up in the sheet. This will frequently cause trouble by breaking the weld on one side of the patch.

The most successful method that has been found for handling the welding of such a patch is to start at the top side, shown as side "A—B" in Fig. 11. First a heavy tack weld is placed in the center of the top, at point No. 1. The weld is then started at point No. 2 and progressed toward point No. 1 as indicated by the arrow. After this section is completely welded, the section between points No. 2 and 3 is welded by starting at point No. 3 and welding to point No. 2, and so on until the section between points No. 5 and No. 1 has been completely welded by the back step method. Welding is then started at point No. 7 and carried on to point No. 6. Thus, by the back-step method, as indicated by the arrows and described above, the section between points No. 1 and 6 is completed.

In due time the weld should be tested with the bare hand to see if it has cooled sufficiently to go ahead with the welding. If it has, the welding should be started in the section between corner "B" and corner "C" by first placing a heavy tack weld at corner "C." The section in between should then be welded by the back step method, taking the steps in rotation as numbered and as indicated by the arrows. After this section is finished, it should be allowed to cool until the bare hand can be placed on the weld before the welder starts at another location.

The next section to be welded should be section "A—F." A heavy tie should be placed at corner "F" and the section in between welded by taking the steps in order as numbered, and welded in the direction indicated by the arrows. It should be allowed to cool as described above. In the same manner sections "C—D," "E—F," "D—K" and "K—E" should be welded in the same order listed, always back stepping the welds in the order indicated by the numbers, and in the direction indicated by the arrows. If both side sheets are receiving patches, it is best for the welder to weld a side of one patch, and then a side of the other patch. This will allow plenty of time for cooling.

Thus, from the description above, it can be seen that the welding of the patch is just a matter of considering each side as a straight line weld, independent of the other sides, and it should be handled accordingly, care being exercised to permit reasonable cooling so as to minimize strains due to contraction. The general principles of boiler welding are covered in the description given above and most phases of boiler welding are based on these principles.

It no doubt has been noted that only butt welding has been described. Butt welding, as compared with lap welding, has been proven far superior for firebox work. The relative merits of the two types of welds are too well known to warrant a discussion of the subject.

In boiler welding great care should be exercised to see that the very best fusion is obtained, as the maximum strength obtainable in the weld is required. One point that must be closely watched is the length of the arc. A short arc only should be used, as it makes a much stronger weld than a medium or long arc, due to a number of facts, principal among which are that better penetration is obtained by the short arc, and that oxidation of the metal is held to a minimum.

Mention MODERN MACHINE SHOP when writing advertisers. You will be co-operating with us, and then we can co-operate better with you.

The DRAWING TABLE WITHOUT A COME-BACK

The Hamilton Steel-Base Table

FIFTY YEARS OF QUALITY

For half a century the Hamilton Mfg. Co. has devoted its efforts exclusively to the manufacture of Quality Professional Furniture.

Use the Coupon

HAMILTON MFG. CO.
Two Rivers, Wis.

UNBREAKABLE
Base of steel, not cast iron. Strong, rigid, unbreakable.

ADJUSTABLE
Adjustable in height or slant. Has the new spiral-shaft-lever movement. Adaptable to vertical drafting.

COMFORTABLE
Note the large foot-board.

SAFE
Top cannot drop down accidentally. The hand wheel on side must be turned.

HAMILTON MFG. CO., Two Rivers, Wis.
Please send me Catalog No. 7-MS.

Name .....
Firm Name .....
Title .....
Address .....
City ..... State .....

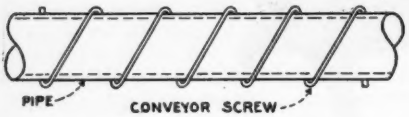
Ideas From Readers

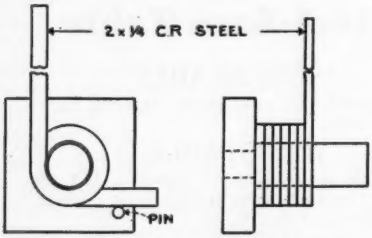
This department is a clearing house for ideas. If there is a "kink" or short cut in use in your shop, send in a description of it. We will pay $5 for each one published.

Simple Method of Making a Conveyor Screw

By CHARLES KUGLER

SOME time past I was given the task of making a conveyor screw. I started out by making a mistake in trying to wind the screw from 2 x ¼-





Showing a simple method of making a conveyor screw.

in. cold rolled steel in the lathe. It might be made in a lathe from material as large as the dimensions given, but probably not without the use of special fixtures. I finally completed the job as follows:

I obtained a section of shafting with a large flange on one end (this flange happened to be square), and drove a pin into the flange as a stop for the end of my conveyor screw. Then I heated the steel from which the screw was to be formed and twisted it around the shaft, alternately heating the steel and forcing it around the shaft with a sledge hammer. I then slipped it over a long length pipe and opened it out to the correct pitch.

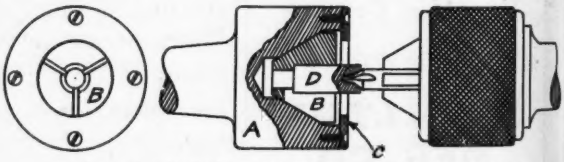
In twisting the steel bar around the shaft, it is necessary to keep the section upon which you are working well heated; it should not be worked cold. As a considerable amount of power is necessary to open the screw to the desired pitch, this task can be performed with the aid of a chain block.

Self-Closing Collet for Centering Short Work

By R. H. KASPER

THE illustration shows details of construction of a self-closing collet that was designed to hold short cylindrical pieces while centering in the lathe. The construction is such that the headstock spindle need not be stopped for gripping or releasing the work, the pressure of the center drill against the work causing the jaws to close.

The drawing shows the work, **D**, in



Design of self-closing collet for centering short work.

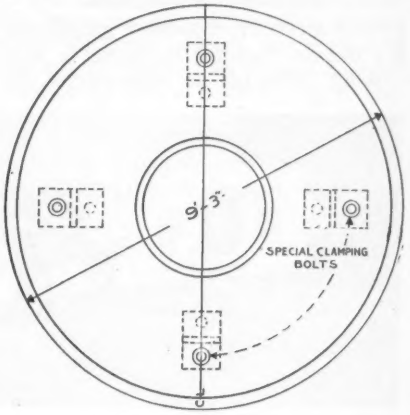
position. The shell of the collet, **A**, is taper bored to carry the split conical part **B**. Part **B** is bored to fit the

work and is slitted at three equidistant points for the greater part of its length, so that it will close in on the work when forced into the tapered bore of the shell **A**. A shoulder in the part **B** serves as a stop for the work. The retaining plate **C** is used to retain the part **B** in the shell **A** when the work is removed. Variations of this design may be used for many purposes, and, if properly made, it will be found a valuable time-saver.

Machining an Oversize Job on the Boring Mill

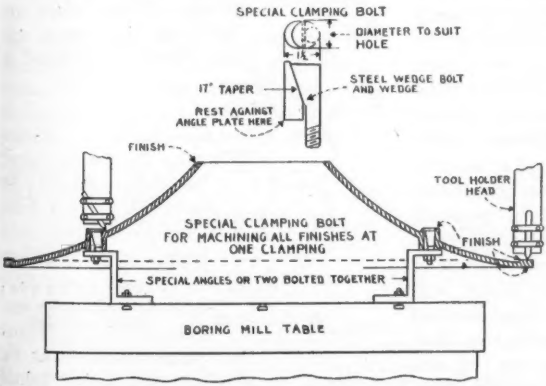
By S. N. SMITH

THE illustrations show how, with the aid of a couple of special angle plates and four special clamping bolts, I was able to machine a casting on a boring mill for which it ordinarily would have been considered too large. In order to obtain a bearing surface upon which to locate the piece, I clamped four special angle plates to the table of the mill, and, after facing the four bolt bosses in the casting, located these bosses on the angle plates. The job called for the upper ends of these bosses, the upper and lower faces of the rim, and the upper end of the casting to be machined accurately and in the correct relation to each other.



Plan view of casting.

In order to machine the upper ends of the bolt bosses, it was necessary to hold the casting by some means that would not interfere with the tool. Accordingly, a special clamping bolt was used, consisting of a wedge bolt and wedge, by which the hole was gripped from the inside. The tighter the nut was drawn up on the bolt, the tighter the wedge gripped the inside wall of the hole. The casting was bolted to the angle plates with these wedge bolts, and the machining operation proceeded in the usual manner. The wedge-bolts held firmly, and an accurate job was obtained.

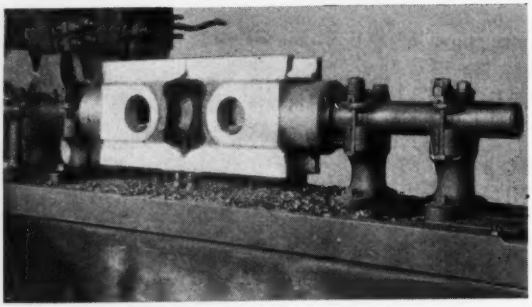


Cross-section drawing showing how an oversize casting was machined on a 10-ft. boring mill.

Fixture for Planing Crossheads

By JOHN MCCULLAGH

LOCOMOTIVE crosshead guides are usually handled in pairs, in machining, although in some shops the tools and equipment will allow of machining only one guide at a time. There are, however, many advantages to be gained by handling all the operations in pairs, so that the two guides are machined simultaneously.



Two crossheads set up for simultaneous machining.

The making of preparations to carry out this method of procedure led to the construction of the fixture shown in the illustration. The fixture consists primarily of four cast V-blocks that are bolted to the planer table. A bar similar to a piston rod is assembled to the crosshead, then the crosshead and bar are placed in position with the bar in the V-blocks, where it is clamped as shown. The crosshead is supported by adjustable jacks, and the two crossheads are thus located as close together as possible, so that the stroke of the planer can be adjusted to the minimum. After the pair of crossheads has been machined on one side, the pressure of the clamps is released and the crossheads are revolved 180 degrees, then they are realigned, the clamps are tightened, and the opposite sides are finished.

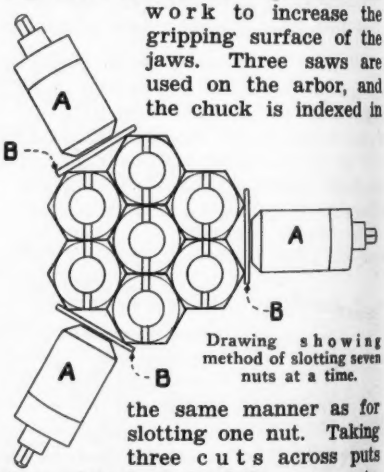
This set-up affords a rapid means of handling the operation, with the assurance that both crossheads will be machined uniformly, thus permitting the use of guides of similar dimensions on both sides of the engine.

Fixture for Slotting Castellated Nuts

By CHARLES KUGLER

WHEN it is necessary to slot a quantity of nuts, yet the quantity is not great enough to warrant the making of a special fixture, a satisfactory amount of production can be obtained by slotting seven nuts at a time, using the method illustrated in the drawing.

A chuck with three jaws is used to hold the nuts, a piece of metal, **B**, being used between each jaw and the work to increase the gripping surface of the jaws. Three saws are used on the arbor, and the chuck is indexed in the same manner as for slotting one nut. Taking three cuts across puts three slots in each of the seven nuts. I was able to increase production 60 per cent by using this method, without making any new equipment excepting the three small flat pieces of steel.



Drawing showing method of slotting seven nuts at a time.

(*Continued on page 49*)

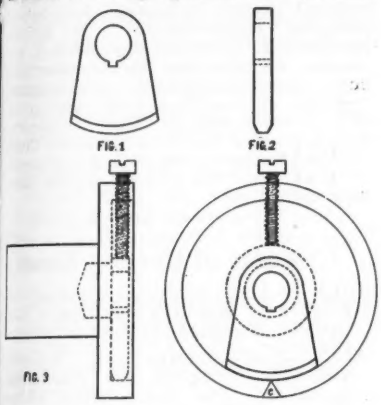
Ideas From Readers

(*Continued from page 44*)

Reclaiming Warped Marking Dies

By F. B. HELANDER

THE drawing illustrates the tool used to reclaim a number of expensive marking dies that had sprung in the hardening operation. The dies



Drawing showing holder used to reclaim warped marking dies.

had warped so badly that it was impossible to use them in the device in which they were customarily held, several in a group. It might have been possible to set up each die in an internal grinder, with an indicator, and then grind the hole true with the face, but even then there would be no guarantee as to the accuracy of the finished job, due to the fact that the face of the die comprises but a small section of a circle. Front and side views of the die are shown as Fig. 1 and 2.

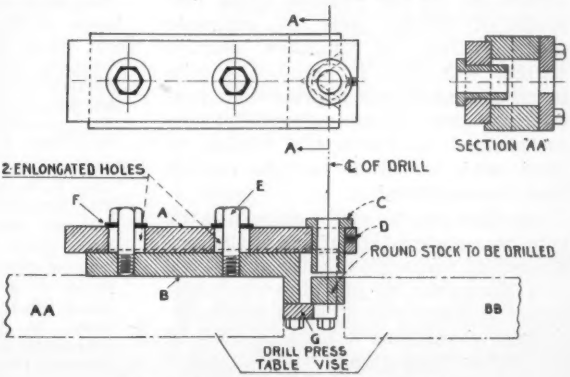
A holder was turned, with a shank by which it could be chucked, as shown in Fig. 3, and carrying a setscrew for clamping the die. The radius of the inner face of the holder was the same as that on the face of the dies. Each die, in turn, was placed in the holder, located as closely as possible to the center point C, Fig. 4, and clamped in that position by tightening the setscrew. The dies were thus ground accurately and uniformly, saving the time and expense of making new dies.

Fixture for Drilling Small Round Work

By HAROLD F. KARRENBAUER

THE drawing shows a gig fixture that was designed to hold small round work such as rollers, bushings, collars, and so on, for drilling in a drill press. The fixture was, however, designed for use in a shop where complete automatic machinery was not available.

The drawing shows the fixture as used with a drill press with a table vise, although the table vise is not an absolute necessity. The fixture consists of a guide plate **A**, carrying the hardened steel bushing **C** and mounted on the V-block **B**. The ¼-in. standard safety setscrew **D** holds the bushing in



Fixture for drilling small round work.

place. The guide plate and V-block are held together by the ⅝-in. cap-screws **E**. The fixture is strapped to the vise and the guide plate **A** is adjusted by releasing the cap screws **F** and moving the guide plate so as to locate the bushing central with the work. The work is clamped in the fixture by the moveable jaw **BB** of the vise. This tool serves the purpose, and is both cheap and adequate.

Kearney & Trecker Corporation Holds Exhibition

In connection with its annual sales conference, which was held the week of July 12th, the Kearney & Trecker Corporation, Milwaukee, Wis., gave an exhibition and demonstration of the complete new line of Milwaukee milling machines that has been developed by this firm recently. The demonstration was put on for three days, during which time visitors were present from all parts of the country. The total registration for the three days, exclusive of the 75 representatives, was 891.

The demonstration was divided into various stations, with a total of 43 individual exhibits. The outstanding feature of the show was the demonstration of the several types of machines set up for various types and kinds of milling jobs. A complete demonstration of tungsten carbide milling was also included, the jobs being operated on a floor-to-floor production basis. A separate exhibit was maintained in which the milling of steel with tantalum carbide cutters was demonstrated.

Another feature of the show was the continuous operation of one of the new knee-type milling machines at a speed of 1,500 r.p.m. The machine was started on Monday and stopped Saturday, during which time it made a total of 10,629,350 revolutions.

The opinion was expressed that this show was the largest of its kind ever held in the machine tool industry.

B & S Issue Pump Circular

A circular that has been issued by the Brown & Sharpe Mfg. Co., Providence, R. I., lists the complete line of pumps manufactured by this company, including pumps of gear, vane and centrifugal types, adapted for various pumping requirements. It includes pumps for hydraulically-operated machines, for supplying liquids under pressure, for circulation, for pumping coolants on machine tools, and so on. The circular also includes engineering data and other useful information. Copies can be obtained from B & S representatives or from the factory at the above address.

Calendar of Coming Events

JULY 27-AUG. 1—Fourth Biennial Conference of World Federation of Educational Societies, at Denver, Colo.

AUG. 23-29—International Industrial Relations Congress, at Amsterdam, Holland. For information address Mary van Kleeck, Russell Sage Foundation Bldg., New York, N. Y.

SEPT. 21-25—Annual Meeting of American Society for Steel Treating and National Metal Exposition, at Commonwealth Pier, Boston, Mass. W. H. Eisenman, Secy., 7016 Euclid Ave., Cleveland, Ohio.

OCT. 12-16—Twentieth Annual Safety Congress, at Civic Opera Bldg., Chicago, Ill.

OCT. 13-16—Twenty-fifth Annual Convention of Illuminating Engineering Society, at William Penn Hotel, Pittsburgh, Penna. Secy., Illuminating Engineering Society, 29 West 39th St., New York, N. Y.

NOV. 30-DEC. 4—Annual meeting American Society Mechanical Engineers, at Engineering Societies' Bldg., 29 West 39th St., New York, N. Y. Calvin W. Rice, Secy., same address.

NOV. 30-DEC. 5—First National Exposition of Mechanical Handling Equipment, at Grand Central Palace, New York, N. Y. Chas. F. Roth, Mgr., International Exposition Co., Grand Central Palace, New York, N. Y.

PROTECT NET PROFITS

with STACKBINS

THE manufacturer who attacks his production and materials handling problems with cost-reducing equipment is going to get out of his present difficulties quicker than the one using obsolete methods.

STACKBINS are modern and economical—they are designed not simply to store materials, but also to save space, time and effort in assembly work.

STACKBINS are adapted to handling by skid-truck, roller, belt or overhead equipment. Their cost is remarkably low—and pay their initial cost many times over.

Investigate this modern cost-reducing equipment—now.

Write Today
For Details and Prices

Stacked and Still Accessible

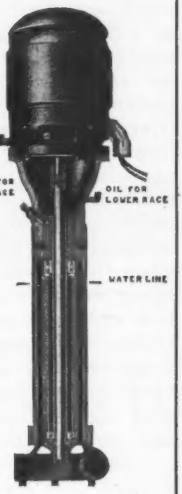
Patents Pending

STACKBIN CORPORATION
PEARL AND RICE STREETS
PROVIDENCE, R. I.

Does Your Equipment TAKE or MAKE *Profits?*

Simple, Sturdy, Efficient, Trouble-Proof!

BROWNIE COOLANT PUMP



PUMPS fluid impregnated with emery or lapping compound, etc. Centrifugal in operation. Self-aligning, no packings to leak, no screen to clog. No bottom or pan under impeller to collect grit or chips. Drive shaft, impeller and protector tube are one unit, revolving together. Coolant cannot come in contact with ball bearings which are within 1" of impeller. Two sizes: 60 gallons per minute, with ½ H.P. Motor: 20 gallons per minute, with ¼ H.P. Motor; or belt drive can be furnished.

Write for bulletins, prices, discount on any product listed in cut below.

----------COUPON----------

TOMKINS-JOHNSON CO., Jackson, Mich.
Please send information, prices and literature on—

.....

Name.....

Address.....

Tomkins-Johnson
JACKSON MICHIGAN
AIR-OPERATED ARBOR PRESSES
COOLANT PUMPS
MILLING CUTTERS
END MILLS
COLLET CHUCKS
AIR-OPERATED CYLINDERS
NON-ROTATING, TUBULAR TYPE
AIR-OPERATED CYLINDERS
ROTATING, DOUBLE-ACTING
AIR-OPERATED CHUCKS
Send For Catalog

Over the Editor's Desk

Leisure Time Is Thinking Time

THE large number of new products —and improvements in old products—that are now being offered indicate that the time which has hung so heavily on the hands of industry throughout the past year has not been entirely lost. The more progressive firms have taken advantage of the lull to crystallize ideas that otherwise would have remained indefinitely in the embryo stage. New and better products are now available as a result. Others have seen in the slow movement of business an opportunity to revamp their shop layouts and have taken this time to rearrange their plant equipment to better advantage. Systems have been installed that will, when the wheels are spinning merrily again, make for smoother plant operation and lower manufacturing costs.

New equipment is needed, in many cases, to bring an otherwise excellent plant up to a point where its possibilities can be realized to the utmost—and now is the time to select that equipment. The weak spots in the production line should be surveyed and selections made of needed equipment so that such equipment can be ordered when the opportunity arrives. That tote-box that has to be filled and moved from one machine to the next can be replaced by an inclined roller conveyor which will not only move the pieces, but will also eliminate the time and labor required to pile the pieces carefully in the box. That old drill press and the tapping machine farther down the line can be replaced with a two-spindle machine that can be run by one operator, for small work, or by a modern-type drill press with a reverse gear and lever for tapping, if the work is large. Time can be taken now to pour concrete bases for the machines that should have them; guards can be made up for belts and gears that have been left unguarded; belts can be gone over and repaired; all sorts of repairs and replacements can be made that would be practically impossible when the shop is busy.

The least any live superintendent or foreman can do is to keep himself posted as to the equipment that is available in his field, and the advantages of the later types of equipment over the more antique machines. Any manufacturer will gladly send copies of his catalogs to any person holding an executive position, and the executive can keep posted on the latest in methods and equipment at practically no cost and but little of his time.

Going Up!

WITH a railroad ordering $16,000,000 worth of equipment at a clip, an order being placed with a Diesel engine manufacturer for engines to cost more than $2,000,000, and an automobile manufacturer buying $250,000 worth of gear finishing machines in one order, business seems to be looking up. It has been evident to careful observers for some time that prices have ceased cascading and are resting quietly at the new levels; confidence has been evidenced at scattered and distant points, but everyone has been waiting, hopefully, for a sign that could be relied upon.

The President's proposal that Germany be given a chance to get on its feet seems to have been the ray of sunshine that was needed to dissipate the fog through which the world has been stumbling. Reports from all sides indicate that business is picking up in all lines and, if history repeats itself, a few months more will see prosperity again at the peak. And history has never failed, thus far, to repeat itself.

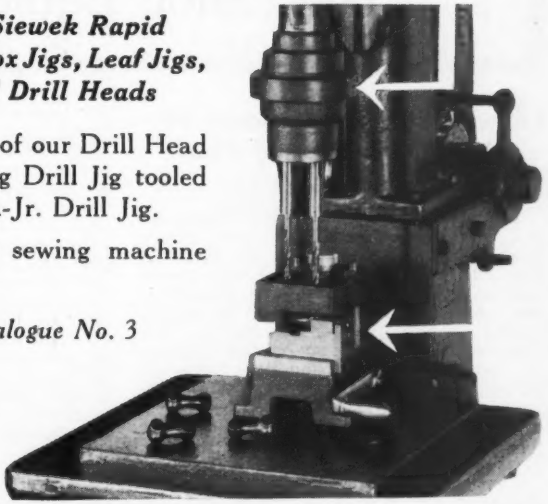
SIEWEK TOOL COMPANY

Manufacturers of Siewek Rapid Clamping Drill Jigs, Box Jigs, Leaf Jigs, Fixture Locks and Drill Heads

This cut shows a set-up of our Drill Head and our Rapid Clamping Drill Jig tooled complete on the Type A-Jr. Drill Jig.

This job is in a large sewing machine company in the East.

Write For Our Catalogue No. 3



The SIEWEK TOOL COMPANY

10232 Woodward Ave.
Detroit, Mich.

Complete stock of Kellerflex Machines, rotary files, grinding wheels and polishers at Chicago and Brooklyn.

KELLERFLEX

KVE

AUTOMATIC

Adjustment of Machine to Work

PERFECT BALANCE of motor and shaft is achieved in the Kellerflex by mounting the motor on an adjustable sliding bracket in a universal swivel yoke. The machine responds INSTANTLY to the slightest movement of the handpiece. It follows the work—relieves strain on the cable—avoids sharp bends—reduces shaft friction.

Remember—the Kellerflex is a quality, ball-bearing equipped machine throughout. The motor is full-sized. A wide range of speeds permits use of the right tool at its correct speed with greatest efficiency. Practical experience with actual working conditions is reflected in every detail of its design and workmanship.

KELLER MECHANICAL ENGINEERING CORP.
84 FRONT STREET BROOKLYN, N. Y.

New Shop Equipment

Hanchett No. 900 Series Hydraulically-Operated Face Grinding Machines

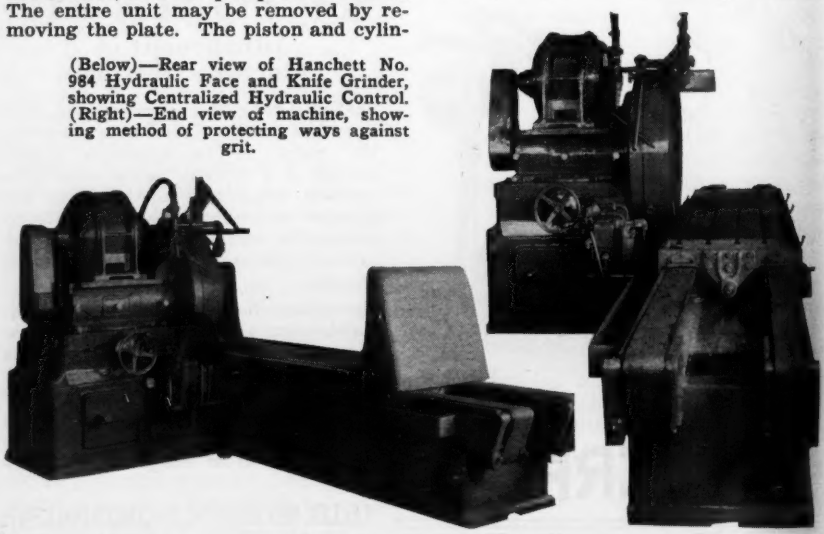
The illustration shows the Hanchett No. 984 Hydraulic Face and Knife Grinder, which is one of the No. 900 Series hydraulically-operated face grinding machines that have been placed on the market by The Hanchett Manufacturing Co., Big Rapids, Michigan. The features of the machine are the hydraulic method of operating the table or platen, the construction of the bed proper, centralized control, unusually heavy grinding wheel spindle, and method of protecting the machine ways against grit and dust.

The pump which pumps the oil for the hydraulic system is driven by a 7½ h. p. motor. The pump is of the constant flow type, operating at a pressure of 300 lb. to the sq. in. The pump and motor are located on brackets on a plate in the side of the machine, the motor on the outside, and the pump on the inside. The entire unit may be removed by removing the plate. The piston and cylinder type of construction is used, eliminating all gears and racks. A standard range of table speeds from 0 to 90 ft. per min. is provided, and this range can be increased to a maximum of 160 ft. per min., if desired. A foot pedal is provided within reach of the operator for by-passing the dogs and running the carriage to the safety dogs when loading, unloading, or inspecting the work.

Hydraulic automatic cross-feed of the grinding wheel head is provided in amounts ranging from .00025 in. to .005 in., although the wheel can be advanced by hand as well. Of great importance in the construction and mounting of the grinding wheel is the fact that it can be adjusted to a plane absolutely perpendicular to the face of the work table top. It can also be adjusted sidewise, too, so as to give clearance to the rear side of the grinding wheel, which is done when it is desired to grind concave.

The bed of the machine is so designed that there is no overhang when the table has traveled to the extreme end of the stroke, thus adding to the rigidity of the

(Below)—Rear view of Hanchett No. 984 Hydraulic Face and Knife Grinder, showing Centralized Hydraulic Control. (Right)—End view of machine, showing method of protecting ways against grit.



Magnetic CHUCKS

look alike outside; but only the Superpower is

DESIGNED AND CONSTRUCTED to give SUPER SERVICE

1. Uniform holding power.
2. Maximum magnetic surface.
3. High flux density.
4. Rigid face plate, firmly supported.
5. High electrical efficiency.
6. Absolutely waterproof.

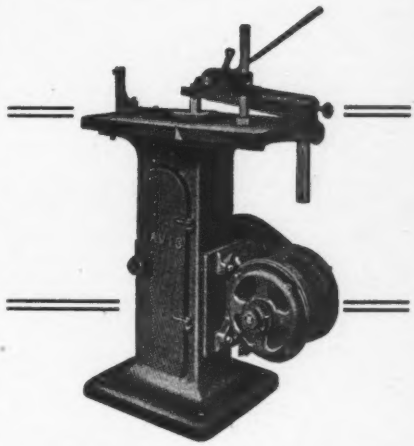
Send for Bulletin N-144

The Taft-Peirce Manufacturing Company
WOONSOCKET RHODE ISLAND, U.S.A.

Taft-Peirce *Super*-POWER Magnetic Chucks

Winning...

Where Other Methods Fail!



KEYSEATING on a shaper or some other large shop tool is costly . . . costly, due to its slow, complicated set-up.

But that's where the Davis Keyseater wins out. TWO MINUTES is all that is required to set up this tool for any job from $\frac{1}{16}$" to 1" wide and 12" high. It cuts tapered or straight keyways with equal efficiency.

Get the whole story of DAVIS Two-Minute Set-Up . . . it means maximum production at lower costs! Send the coupon.

Davis Keyseater Co.

250 MILL ST. ROCHESTER, N. Y.

Send me the whole story of the Davis Keyseater and the Two-Minute Set-Up.

Firm.....

Name.....Title.....

Address.....

City.....

State.....

machine. Further stability is provided by the design of the table ways, the inner way being of the V type and the outer way flat. Each of the ways is of unusual width and the center distance between the ways is much greater than has been allowed heretofore, providing a substantial foundation for the table.

An effective method has been developed of lubricating the ways and thus preventing heavy wear. Heavy fabric composition belts are connected to each end of the table, passing over pulleys with adjustment, and across underneath the table, through the bed. The belt-covered ways are clearly shown in the end view of the machine. Forced feed lubrication is provided, the oil draining down into channels off the ways through a Purolator system, where it is cleaned and returned to the oil pump.

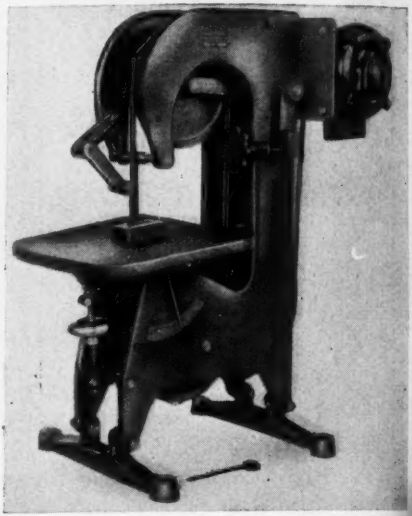
The No. 984 machine regularly carries a 36-in. diameter segmental wheel chuck, which is driven through silent chain by a 40 h. p. motor. A counterbalanced wheel dresser is always ready for instant use. The spindle, which is of extra heavy proportions, is carried in precision-type radial and thrust ball bearings. The spindle is provided with a brake by which the grinding wheel can be stopped quickly after power has been shut off. Two 1¼-in. streams of coolant are flooded over the wheel and work by a Ruthman coolant pump unit located within the 75-gal. tank.

The No. 900 machine is made in various lengths, with capacities ranging from 50 in. to 192 in. The approximate weight of the 84-in. machine (No. 984), including motors, chuck, wheels, and wet grinding system, is 18,500 lb. Floor space required, 7½ ft. x 18 ft.

Grob Continuous Filing Machine, Model B-1

Grob Brothers, 90th and National Ave., West Allis, Wis., have added a bench-type continuous band filing machine to their present line. The machine, which is designated the B-1, is designed for either external or internal filing of small and medium-size work that requires fitting or forming. It is basically suited to tool and die making, in that deep, flat surfaces up to 4 in. in height can be finished within close tolerances. Many novel features are incorporated in the construction of the machine, such as automatic tension to the driving belt, a positive drive to the file chain, full-support back-rest, positive adjustment to the work-table, a combination of three filing speeds, and a band of files that offers a continuous cutting action.

The body of the machine is made from two heavy castings to which all intermediate members are attached. The continuous chain is made up of a series of files that are joined together by links



Grob Model B-1 Continuous Filing Machine.

so that they operate on two sheaves. The motor is mounted at the rear of the machine body. Power is transmitted to the main drive pulley by means of a V-belt, and the drive from the main drive pulley to the lower sheave is also by V-belt.

Automatic tension to the main drive is accomplished by mounting the main drive pulley on a hinged bracket which, in turn, is attached and pivoted on the ends of the lower sheave bearing shaft. When pressure is applied to the filing chain, a tension is set up in the lower sheave which is transferred to the hinged bracket in such a way that it develops a torque, causing the main driving belt to tighten. As the filing pressure is increased, the tension on the belt is likewise increased, and a constant, smooth drive is obtained.

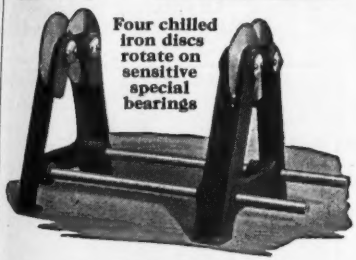
In addition to the friction drive that results from having the chain operate between two sheaves, a series of driving pins, located within the groove of the lower sheave, offers a positive drive to the chain and prevents slippage in the

Anderson Improved
Balancing Ways
No Leveling Required

A simple and excellent device for balancing, straightening and trueing.

They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in Lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000



Four chilled iron discs rotate on sensitive special bearings

Write For Full Information

Mfd. By **Anderson Bros. Mfg. Co.**
1926 Kishwaukee Street, Rockford, Ill.

"TWO MACHINES IN ONE"...

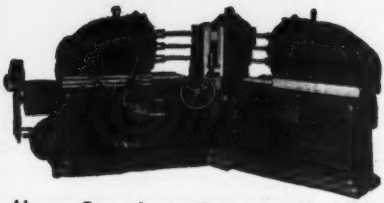
...That's what you get in the RHODES "Convertible" Shaper and Slotter . . . a double duty machine that gives you double advantages.

The RHODES "Convertible" is adaptable to a great variety of uses in the shop. As a shaper, or as a slotter, it provides the means of economically handling a wide range of work, ordinarily assigned to larger mahines.

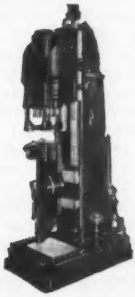
Let us tell you all about this space-saving, money-saving, modern shop tool. Write for a cirular.

THE RHODES MFG. CO.
WALTHAM, KY.

STANDARD & SPECIAL DRILLING & BORING MACHINES



Above—One of our Four-way Horizontal Machines.



Right—Vertical Drilling and Reaming Machine with special fixture mounted on column.

W. F. and John Barnes Co.
ROCKFORD, ILLINOIS
Established 1872

event excessive pressure is applied while filing. The drive pins are provided with a floating action so that they can seat and adjust themselves properly against the back edges of the files.

The channeled links for each file are connected with a series of straight links by pins and flat springs, so that they form an endless chain. The chain is of the self-locking type, but can be disengaged easily when it is to be used for internal filing. Filing chains can be furnished in either flat, half-round, or diamond shapes. Tension on the filing chain is adjusted by means of a handwheel at the right side of the machine which connects with a bracket that moves the upper sheave either up or down as desired. An adjustable rubber-covered roller keeps the chain of files firmly against the back rest.

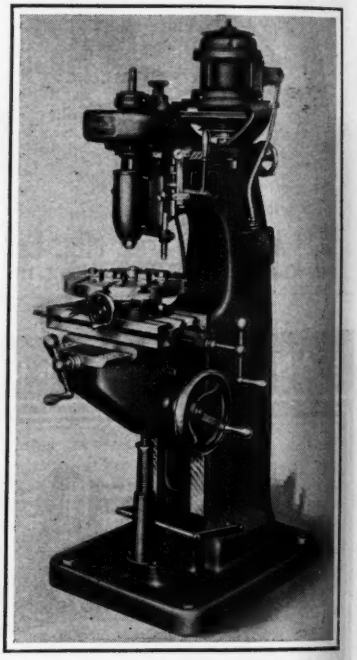
The work table can be adjusted 25 degrees either forward or backward. A graduated plate and pointer are used for the purpose of setting the table to the desired angle, whereas positive adjustment is made by a small handwheel located at the under side of the table. The machine is 29 in. high and occupies a space 15 x 15 in. The table is 13 in. above the bench, and has a working surface 12 x 14 in. Power is supplied by a ¼ h. p. motor. Weight, 150 lb. complete.

Reed-Prentice No. 2V Router and Vertical Milling Machine

A router and vertical milling machine for use on brass, steel, or cast iron, known as the No. 2V, has been placed on the market by Reed-Prentice Corporation, Worcester, Mass. This machine is a new design of the No. 2 size which is widely used in stamp, stencil, and light die manufacturing.

The machine is powered by a 1 h. p. ball-bearing vertical motor, either 900, 1200, or 1800 r. p. m., providing spindle speeds of 500 to 3,000, 666 to 4,000, or 1,000 to 6,000 r. p. m. Speeds to 12,000 r. p. m. can be furnished if desired. The pulleys are of heat-treated aluminum alloy and are balanced for high speeds. The spindle pulley is guarded. The motor is carried in a bracket that is fitted to the dovetail of the column, and is adjustable for proper belt tension by means of a screw and hand wheel. The spindle pulley is provided with a double auxiliary support carrying ball bearings and eliminating the belt pull on the spindle.

The spindle is of chrome molybdenum steel, ground all over and carried in ball bearing mountings. Precision ball bearings of deep race design are mounted in pre-loaded condition to take thrust and radial loads, while the belt pull is taken on radial ball bearings mounted in a double auxiliary support. The spindle is provided with a collet hole for the new type collet with long and gradual taper, providing maximum cutter-holding capacity. When desired, the spindle can be furnished with a No. 7 B & S taper hole. The spindle is lubricated by means of grease cups at each bearing, which provide sufficient lubrication to last 30 days. All rotating parts are balanced, insuring non-vibrating operating



Reed-Prentice No. 2V Router and Vertical Milling Machine.

conditions at highest spindle speeds. The sliding head is fitted to the dovetail of the column, and generous, hand-scraped bearings insure perfect alignment of the spindle and long life. The head is controlled through a foot treadle and clutch-type handle.

The auxiliary bracket carrying the spindle pulley also contains a brake and lock. A slight turn of the handle will stop the spindle at any speed through

End-to-End Precision

WHEN you buy pinion rod . . . you want end-to-end precision. And when you buy M-C PINION ROD you GET end-to-end precision.

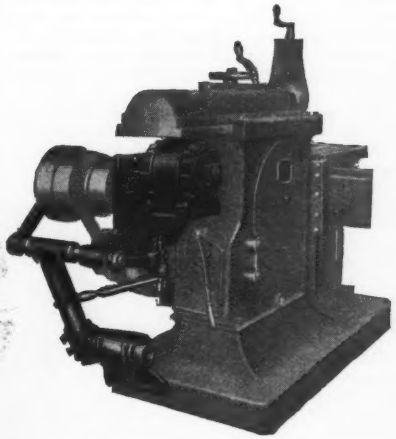
Production men everywhere have found that the unusual end-to-end precision of M-C PINION ROD insures greater accuracy and uniformity of the pinions when cut.

M-C PINION ROD is made in all sizes and in convenient lengths. Better let us quote and show you how to make substantial savings.

An
M-C Gear
Product

Meisselbach-Catucci Mfg. Co.
70 STANTON STREET
NEWARK, NEW JERSEY

The Cullman Shaper Drive



Motorize your cone pulley Shapers, Lathes and Milling Machines with Cullman Drives. Made in 1, 2, 3 and 5 H. P. sizes. Easy to install; bolts to your machine.

CULLMAN Wheel Company
1336 ALTGELD ST. CHICAGO, ILL.

SPROCKETS - SPEED REDUCERS

event excessive pressure is applied while filing. The drive pins are provided with a floating action so that they can seat and adjust themselves properly against the back edges of the files.

The channeled links for each file are connected with a series of straight links by pins and flat springs, so that they form an endless chain. The chain is of the self-locking type, but can be disengaged easily when it is to be used for internal filing. Filing chains can be furnished in either flat, half-round, or diamond shapes. Tension on the filing chain is adjusted by means of a handwheel at the right side of the machine which connects with a bracket that moves the upper sheave either up or down as desired. An adjustable rubber-covered roller keeps the chain of files firmly against the back rest.

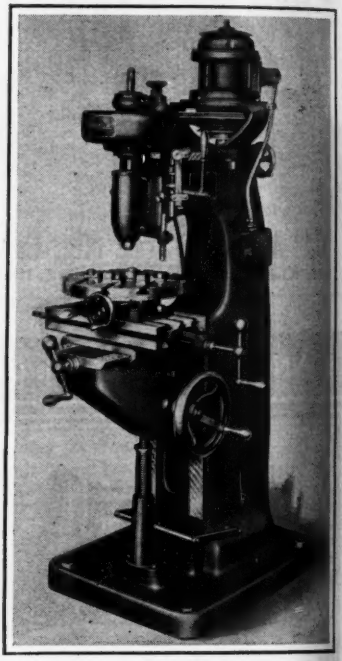
The work table can be adjusted 25 degrees either forward or backward. A graduated plate and pointer are used for the purpose of setting the table to the desired angle, whereas positive adjustment is made by a small handwheel located at the under side of the table. The machine is 29 in. high and occupies a space 15 x 15 in. The table is 13 in. above the bench, and has a working surface 12 x 14 in. Power is supplied by a ¼ h. p. motor. Weight, 150 lb. complete.

Reed-Prentice No. 2V Router and Vertical Milling Machine

A router and vertical milling machine for use on brass, steel, or cast iron, known as the No. 2V, has been placed on the market by Reed-Prentice Corporation, Worcester, Mass. This machine is a new design of the No. 2 size which is widely used in stamp, stencil, and light die manufacturing.

The machine is powered by a 1 h. p. ball-bearing vertical motor, either 900, 1200, or 1800 r. p. m., providing spindle speeds of 500 to 3,000, 666 to 4,000, or 1,000 to 6,000 r. p. m. Speeds to 12,000 r. p. m. can be furnished if desired. The pulleys are of heat-treated aluminum alloy and are balanced for high speeds. The spindle pulley is guarded. The motor is carried in a bracket that is fitted to the dovetail of the column, and is adjustable for proper belt tension by means of a screw and hand wheel. The spindle pulley is provided with a double auxiliary support carrying ball bearings and eliminating the belt pull on the spindle.

The spindle is of chrome molybdenum steel, ground all over and carried in ball bearing mountings. Precision ball bearings of deep race design are mounted in pre-loaded condition to take thrust and radial loads, while the belt pull is taken on radial ball bearings mounted in a double auxiliary support. The spindle is provided with a collet hole for the new type collet with long and gradual taper, providing maximum cutter-holding capacity. When desired, the spindle can be furnished with a No. 7 B & S taper hole. The spindle is lubricated by means of grease cups at each bearing, which provide sufficient lubrication to last 30 days. All rotating parts are balanced, insuring non-vibrating operating



Reed-Prentice No. 2V Router and Vertical Milling Machine.

conditions at highest spindle speeds. The sliding head is fitted to the dovetail of the column, and generous, hand-scraped bearings insure perfect alignment of the spindle and long life. The head is controlled through a foot treadle and clutch-type handle.

The auxiliary bracket carrying the spindle pulley also contains a brake and lock. A slight turn of the handle will stop the spindle at any speed through

End-to-End Precision

WHEN you buy pinion rod . . . you want end-to-end precision. And when you buy M-C PINION ROD you GET end-to-end precision.

Production men everywhere have found that the unusual end-to-end precision of M-C PINION ROD insures greater accuracy and uniformity of the pinions when cut.

M-C PINION ROD is made in all sizes and in convenient lengths. Better let us quote and show you how to make substantial savings.

An

M-C Gear

Product

Meisselbach-Catucci Mfg. Co.

70 STANTON STREET
NEWARK, NEW JERSEY

The Cullman Shaper Drive

Motorize your cone pulley Shapers, Lathes and Milling Machines with Cullman Drives. Made in 1, 2, 3 and 5 H. P. sizes. Easy to install; bolts to your machine.

CULLMAN Wheel Company

1336 ALTGELD ST. CHICAGO, ILL.

SPROCKETS - SPEED REDUCERS

the tension of Raybestos brake shoes, and will lock the spindle securely so that collets or cutters can be changed. A micrometer depth stop attached to the sliding head makes it possible to feed the cutter accurately to the required depth. The dial is graduated in thousandths of an inch, with the vertical scale graduated to two inches and subdivided in tenths. This construction permits the use of thickness gage blocks. Positive locking is provided by knurled nuts.

The saddle extends the full length of the table, forming a rigid support. Cross, vertical, and longitudinal feed screws are provided with micrometer collars graduated in thousandths for accurate control. All screws are provided with ball thrusts, insuring ease of operation of knee, saddle and table.

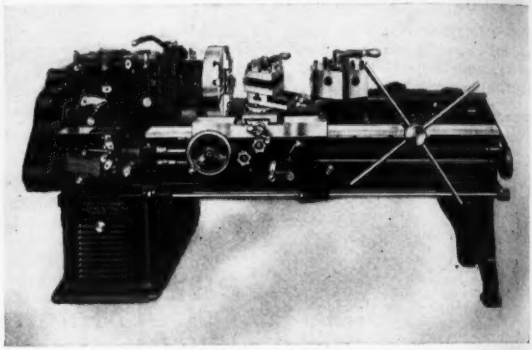
Standard equipment includes a 1 h. p. vertical motor with control, drawbar, one each ¼-in., 5/16-in., and ⅜-in. collets (or No. 7 B & S taper hole in spindle with reducing collet No. 5 B & S taper), three cutters of high speed steel, ¼ in. 5/16 in., and ⅜ in., one endless V-belt, ball cranks, wrenches, vise set blocks, and profile attachment. Extra attachments will be available, such as a rotary table, regular or with chuck, blower attachment with Universal 110-volt motor, cord and plug for lamp socket, adjustable lamp brackets and shades with plug for lamp socket, milling cutters or collets ⅛ in. to ½ in., or in decimal or metric sizes.

The longitudinal feed of the machine is 14 in.; cross feed, 11 in.; vertical feed of knee, 15 in.; head travel with micrometer depth stop, 2 in.; without depth stop, 3 in.; max. distance between spindle and table, 17 in.; working surface, 18 x 8⅞ in.; length of carriage, 16½ in.; hole through spindle, ½ in.; weight, 1,650 pounds.

Turret Attachment for Cincinnati Lathes

The illustration shows one of the latest 20 in. x 10 ft. Cincinnati lathes, made by The Cincinnati Lathe & Tool Co., 3209 Disney Street, Cincinnati, Ohio, with a hexagon turret on the bed, power feed to the turret, square toolblock in the compound rest, and a four-jaw independent chuck. The machine shown is motor-driven, the motor mounting being inside the leg.

The hexagon bed turret is made to revolve automatically, and is provided with automatic independent feed stop for each face of the turret, arranged for either hand or power feed. The power feed drive is from a pulley on the rear end of the carriage feed rod to another rod at the back of the bed. The power feed disengages automatically by means of a trip which stops within a reasonably close limit, but is supplemented by a positive stop which will enable the operator to work accurately to within .001 in. A lever on the slide permits indexing of the turret to any position without the necessity of returning the slide to the extreme end of the stroke. This equipment makes possible the use of ten tools in immediate succession, and the work can be threaded by means of a die in the turret, or a single-point tool in the square toolblock.



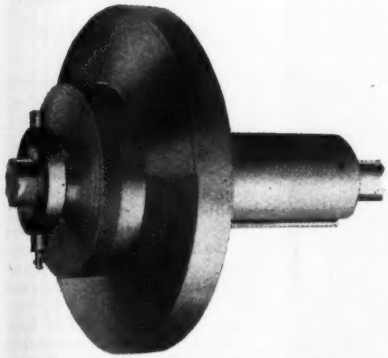
20-in. x 10-ft. Cincinnati Lathe with power-operated hexagon bed turret and square Toolblock.

Dodge "Diamond D" Friction Clutch

A completely enclosed safety disc friction clutch, designed for machinery appliances as well as for power transmission service, has been released by the Dodge Manufacturing Corporation, Mishawaka, Ind. The clutch is extremely compact, dimensions having been kept within practical limits required to transmit its rated horsepower. Large friction area is provided to insure development of full-rated horsepower under practical

unit pressure. Asbestos friction discs with ground faces are used.

The clutch is fully enclosed in both engaged and disengaged positions, insuring complete safety as well as full protection against dust and dirt. One-point adjustment is provided. An ex-



Dodge "Diamond D" Friction Clutch

ceptionally heavy slip ring is used which is easy to lubricate and can be furnished in either bronze or ball bearing types. The movement of the slip ring is positive and is not affected by wear of friction material or adjustment of clutch. A powerful self-locking toggle mechanism is employed which allows easy and positive engagement and disengagement. The clutch is held to close tolerances in all manufacturing operations, insuring accurate assembly, balance, uniform throw, convenient adjustment, and complete interchangeability of parts.

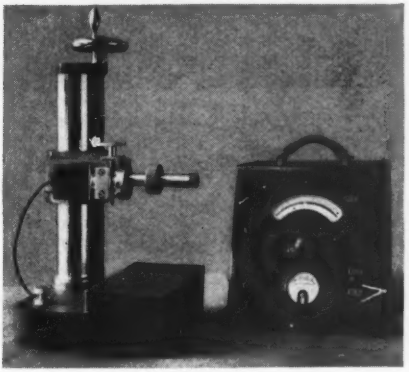
P & W "Electrolimit" Gage

The gage manufacturing experience and facilities of the Pratt & Whitney Company and the electrical engineering skill of the General Electric Company have been combined in the development of the "Electrolimit" gage, which has been placed on the market by the Pratt & Whitney Company, Hartford, Conn. The advantages of the electric gaging method are now within the scope of general shop use.

The Electrolimit gage is an extremely sensitive and accurate comparator, consisting essentially of a gaging head which carries a pointer to contact with the work. The movement of this pointer changes the balance of the electric circuit, so that errors from the true size are indicated by a needle traveling over the scale of an indicating instrument. The gage is suitable for checking work within very close limits, and—owing to its rapidity and simplicity—is applicable to quantity production. Electrical magnification from 500 to 10,000 is possible, making the gage available for a wide range of limits. The length of the scale is 5 inches.

The use of the Electrolimit gage is simple and, as can be seen by reference to the illustration, it can be used either externally or internally. It can quickly be set for extreme accuracy, after which the actual gaging can be performed by the usual operator. No sense of "feel" is required, as the gaging is done entirely by the variation in the electrical circuit that is transmitted to the pointer. The position of the pointer inside or outside of two limit marks indicates whether or not the piece will pass inspection.

When being used for external work, precision gage blocks are used to set the upper and lower limits desired. For in-



P & W "Electrolimit" Gage

ternal work, two master solid ring gages representing the "go" and "no-go" dimensions are used to set the gage.

Campbell Model 30 Cut-Off Machine

A machine that is especially adapted for cutting extra wide stock, in which an abrasive disc is used, has been placed on the market by Andrew C. Campbell, Inc., Bridgeport, Conn. The machine will cut materials of certain characteristics up to 1 in. thick and 16 in. wide at the rate of

Campbell Model 30 Cut-Off Machine

2 to 12 seconds per cut. Nickel, silver, soft iron, hardened high speed steel, and similar materials, can be cut up to ¾ in. thick and 6 in. wide. If the materials are thinner, correspondingly wider cuts can be made.

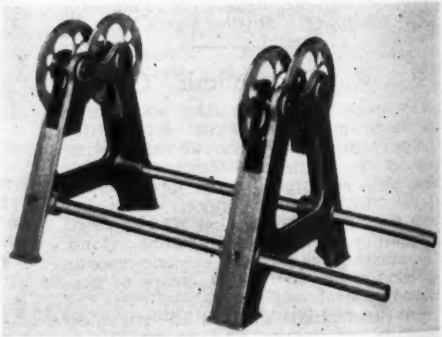
It is said that the success of the machine for cutting such wide stock is due to an unique arrangement for moving the disc through the material. The travel arm is arranged in such manner that the spindle travels parallel to the top of the table without the use of slides. Dirt and grit cannot enter the mechanism to affect the movement of the disc.

The motor is started and stopped by a push button which is conveniently located. A straight edge is provided for locating the work so that the proper angle cut can be made. Quick-acting, adjustable clamps firmly hold the work to the table. Welded steel guards fully protect the operator. Positive drive to the spindle is obtained through the use of six V-belts. The machine is properly counterbalanced so that the feed of the disc is under perfect control of the operator at all times. Both regular and irregular shapes can be cut with the machine.

Sundstrand Super-Sensitive Balancing Tool

The Sundstrand Machine Tool Company, Rockford, Ill., has added to its line of balancing tools a tool of extremely accurate design, for the balancing of light weight parts such as aluminum fans, motor armatures, and so on. The work is balanced on knife edge steel discs which are accurately balanced and mounted on hardened steel spindles that revolve on steel balls. The balls are enclosed in hardened and ground races of special design. This construction is sensitive to a high degree, due to the fact that the spindle has a direct pivoting action on the ball bearings.

The manufacturer claims that the tool is sensitive to such a degree that a 1½-lb. disc can be thrown out of balance with a 5-grain weight on a 3-in. radius. Thus it is possible to obtain satisfactory results when the dynamic method is too slow or too expensive. The equipment is portable and is so constructed that no leveling is necessary; thus the tool can



Sundstrand Super-Sensitive Balancing Tool

The Proof of the Pudding . . .

Any veteran shopman will tell you that the most convincing test of a tool steel is a trial in actual work under normal shop conditions.

That's why we say, "Try POLDI TOOL STEEL . . . use it on your die casting dies . . . intricate blanking dies . . . milling cutters . . . taps . . . gages . . . etc. Let us know if you have a difficult tool problem that retards production. A trial will convince you of the merits of POLDI STEELS more than anything we could say."

The complete line of POLDI TOOL STEELS comprises the finest grades of high speed and tool steels for every requirement. And, you can depend upon prompt deliveries from large warehouse stocks.

WRITE FOR BULLETINS

POLDI STEEL CORPORATION OF AMERICA

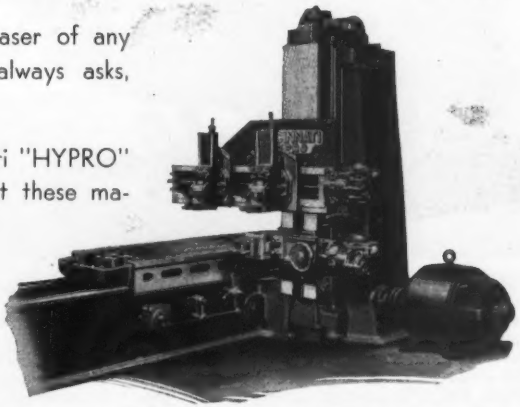
247 W. 18TH ST., NEW YORK 1627 W. AUSTIN AVE., CHICAGO

Representatives in Boston, Hartford, Stamford, Cleveland, Newark

Performance *determines* Value

EVERY prospective purchaser of any piece of equipment always asks, "What will it do?"

And, users of the Cincinnati "HYPRO" Openside planers know that these machines may be depended upon to do the rough work as well as the accurate work . . . and do both at a profit!



THE CINCINNATI PLANER CO.

3100 SOUTH STREET CINCINNATI, OHIO

be used wherever most convenient. The tool has a swing of 22 in., with a maximum dimension between standards of 20 in. The capacity is 12 lb., and the weight is 40 pounds.

"Milwaukee" No. 1 and 2 Knee-Type Milling Machines

A complete series of "Milwaukee" knee-type milling machines, in two sizes and in both horizontal and vertical types, has been announced by the Kearney & Trecker Corporation, Milwaukee, Wisconsin. Either size of the horizontal type is available in three models—universal, plain, or manufacturing—and the vertical machine can be had in either plain or manufacturing model. The outstanding feature of these machines lies in that they are especially adapted for the high speeds that are possible with tungsten and tantalum-carbide cutters. Other features include a greatly-broadened range of spindle speeds—from 15 to 1,500 r.p.m.; feeds from ¼ in. to 60 in. per min.; a "sponson-type" knee; a center-bearing spindle with worm drive, and a multiple V-belt drive, with the motor set at right angles to the spindle.

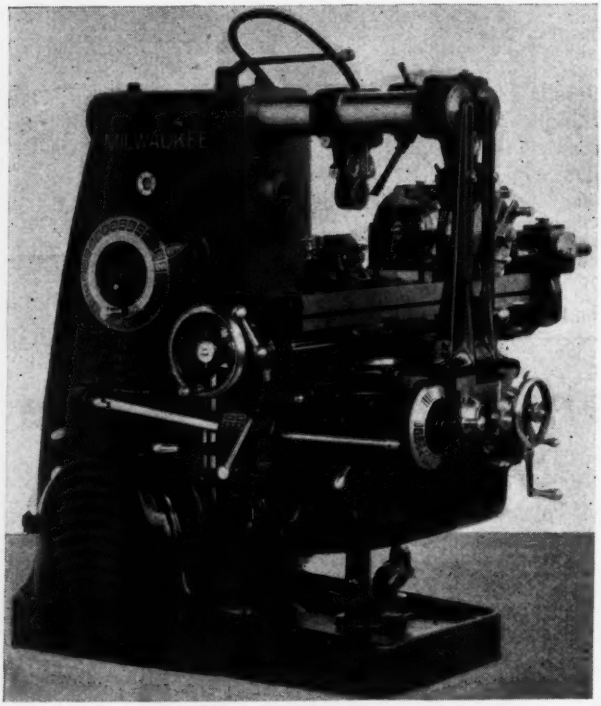


Fig. 1—Milwaukee Universal Milling Machine.

The speed range usually employed in knee-type milling machines has been approximately 25 to 1. For the new Milwaukee machine a 100 to 1 speed range has been selected, with 15 r.p.m. as the lowest and 1,500 r.p.m. as the highest speed. This range permits surface speeds in either direction as low as 50 ft. per min. for a 12½-in. cutter and as high as 100 ft. per min. with a ¼-in. cutter. In order to avoid large gaps between increments, 27 changes are provided, in geometrical progression.

To obtain high speeds and heavy torque in the same spindle, the 27 speeds have been divided into three series of nine each. The nine highest speeds are obtained through silent worm gearing, with the worm mounted directly on the spindle. Although the spindle revolves at speeds as high as 1,500 r.p.m., no other shaft or gear in the entire spindle train runs faster than 600 r.p.m. The nine intermediate speeds are obtained through a hardened steel spur gear in combination on the spindle with a large heavy-duty bull gear for the nine lowest speeds. The bull gear is mounted on the spindle and acts as a flywheel. Drive is through multiple-splined keys cut solid on the spindle. The sliding gears, meshing with the intermediate gear and the bull gear, are in a neutral position when the high-speed worm drive is in action. An anti-friction bearing is placed between the spindle drive worm and the intermediate bull gear combination, so that both series of drives are closely supported between bearings at all times.

The twenty-seven speeds are obtained

LUFKIN TOOLS

Standard of Accuracy

HERE'S an Inside Micrometer measuring from 1½" up, an exclusive LUFKIN feature. Regularly made in sets up to 40". Made special to order in larger sizes.

Extensions are of rigid steel tubing and can be added to either or both ends of the Micrometer head. By keeping the head in the center of the extended tool a perfect balance is maintained.

Send for Catalog No. 6, showing other Precision Tools.

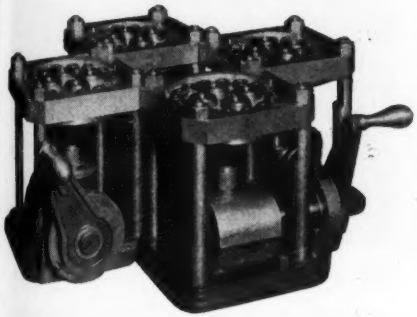
THE LUFKIN RULE CO.

PRECISION TOOL DIVISION

WINDSOR, ONTARIO SAGINAW, MICHIGAN NEW YORK CITY

The Best Now Costs the Least

Whether your production calls for a small run of many parts—or high production of a single part—your tooling cost will be lowest if you use the "Q-C" Method.



Four standard "Q. C." Fixtures mounted on index plate tooled for drilling twenty holes—Clutch Pressure Plates.

With the addition of the 1931 series this method cares for parts regardless of size or shape.

Now is the time to replace inadequate tooling to reduce costs. SEND FOR DATA.

A. H. PEARSON

7 E. Grand Ave., Detroit, Michigan

Exclusive Distributor

Quick Clamp Products

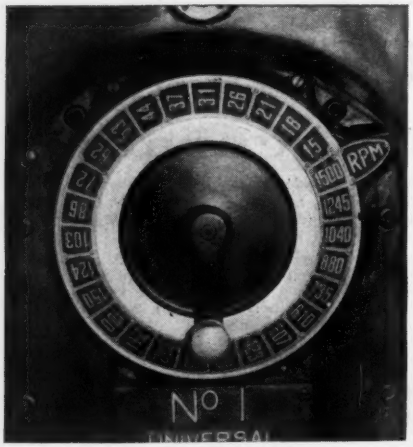


Fig. 2—Speed Change Lever and Indicating Dial.

by a single lever in combination with a large direct-reading dial, as shown in Fig. 2. The lever has but one position and can be revolved clockwise or anti-clockwise for higher or lower rates. This dial is visible at a distance of 40 to 50 ft. from the machine.

The spindle itself is carried on three bearings placed at approximately equal distances apart, which makes for a much stiffer arrangement than ordinarily found. The front and center bearings are arranged to take both radial and thrust loads, while the rear bearing is of the straight roller type. The spindle driving train is carried on a double wall plate in the column. All driving gears are supported between these two walls on short shafts carrying multiple splines, and all gears are closely supported between anti-friction bearings.

To give a wide range of feeds, the Milwaukee machines have a 240 to 1 feed range. The feed range is from ¼ to 60 in. per min. in twenty-seven changes, in geometrical progression. The lever and dial for the feed are on the front of the knee, readily accessible from the operator's normal position. The dial is large in diameter and can easily be read 30 ft. away.

In the manufacturing-type machines both the speed and feed changes are made by means of pick-off gears. Twenty-four speed changes are provided, covering the same range as the quick-change mechanism from 15 to 1,500 r.p.m. The feed range is obtained through eight pick-off gears, providing twenty-four changes of feed from ¼ to 60 in. per min. The gear-box, opened, is shown in Fig. 3.

The front arbor-support bearing is much like the former design, although it is supplied with an oil reservoir which makes the adjustable bushing self-oiling. Heretofore when a gang of cutters was being used that required a center support, the arbor could not be removed from the machine without first taking off the cutters. With the improved construction, the center arbor support is hinged in two halves, each bored to fit over one overarm and accurately locked together. When it is desired to remove the arbor with its cutters assembled, each half of the hinged arbor support is swung around its respective overarm,

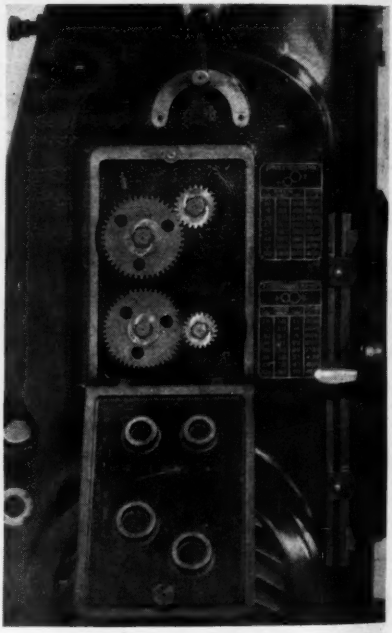
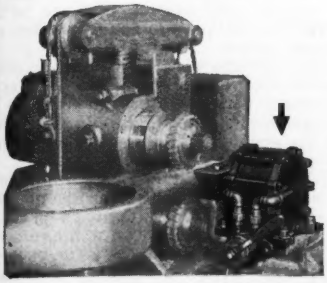


Fig. 3—Pick-Off Gear Box, With Door Open.

and the arbor can be removed with its cutters intact.

The knee resembles an H-column, and the ways at the top are wide and heavy with closed box-section walls and heavy

Chosen By...



INDUSTRY'S LEADERS!

THE best evidence of the quality of "LOGAN" Air Operated Devices is the large number of Industry's Leaders who incorporate these devices in the manufacture of their product.

The illustration shows such an installation. It consists of a "LOGAN" Air Operated Cylinder and Control Valve being used on a well-known and high-grade milling machine as a work-holding device.

Let us show you other cases where "LOGAN" Devices are used as an integral part of a well-known machine. Write for a catalog!

The Logansport Machine Co.
LOGANSPORT INDIANA

"LOGAN"

TURN YOUR DOOR KNOB

and the door is closed. That is all the action you need with a

Boker Chuck

NO KEY

30 Days' Free Trial

Concentric, simple, accurate; only 3 parts.

H. BOKER CO., Inc.
103 Duane St., New York, N. Y.

Send particulars, 30 days free trial.

Name .....

Firm .....

Address .....

City ..... ***State*** .....

projections at each side at the bottom in the form of "sponsons." Both the knee and column are locked solidly together by a clamp operated by a handle at the side of the knee. The knee is inclosed, making flooded lubrication possible.

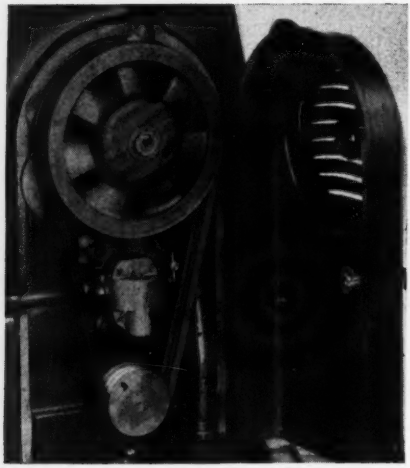


Fig. 4—View of V-Belt Drive, Louvred Door, and Fan-Type Pulley.

The motor is mounted at right angles to the spindle, making the motor accessible from both ends of the column. The V-belt drive is covered by a door in which louvres are cast to admit air for ventilation. Fig. 4 shows the right side of the column with this door open. The driving pulley is of fan construction to draw air in through the louvres, force it past the motor and out through the louvres in the door at the opposite side.

All models are provided with rapid traverse in six directions. The rapid-traverse multiple-disk clutch runs in oil and is carried by a double wall plate at the front of the knee. This clutch can be adjusted without removing the plate from the knee. Engaging the rapid traverse does not disengage the feed, and when the handle is released the feed automatically picks up where the rapid traverse lets go. As a safety measure when the rapid traverse is being used to run the work up to the cutter, the table dog releases the clutch and the feed is then re-engaged with the reverse lever. The rapid traverse for the longitudinal travel of the table is 150 in. per min.; for the knee and saddle, 75 in. per min.

Operating handles are placed so that they will be in the most natural position for the operator. The starting lever is directly in the center of the machine at the top of the column, and can be adjusted to any location for convenient operation, either from the front of the table or at the rear of the table, either side of the machine. Feed and rapid traverse levers are in duplicate, one set for operating the machine at the front and the second set for operating the machine from the rear of the table.

The sliding-head vertical machine is furnished either as a plain machine with 27 speeds and feeds through a quick-change mechanism, or in a manufacturing type with pick-off gears for 24 speeds and feeds. The head has vertical travel of 6 in., and can be furnished with power feed and rapid traverse and with the full range of 27 feeds from $\frac{1}{8}$ to 30 in. per min. Rapid traverse is at the same rate as the cross and vertical traverses, namely 75 in. per minute.

A four-step dial indicator precision stop is provided so that step milling can be done. If three of four heights are to be milled, the slide is permitted to go up by rapid traverse to a height determined by one of the trip blocks. It is then run down by rapid traverse and tripped out by one of the screws on the precision stop. The hand-wheel is then used to lower the head to the zero point on the dial. A close-up of this mechanism is shown in Fig. 5.

Automatic flooded lubrication is supplied for all gears, shafts and internal

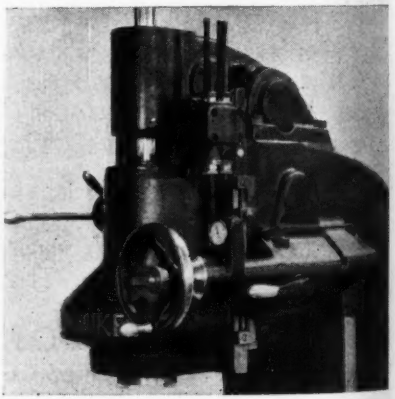


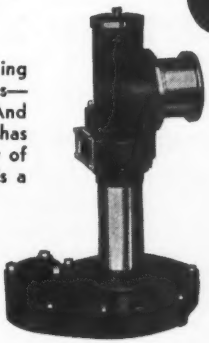
Fig. 5—Close-Up View of Sliding Head of Vertical Miller, Showing Handwheel and Four-Step Dial Indicator Unit.

"Look To the Pumps!"

Don't let yourself be pulled down by the strain of lagging production. Watch your machinery—look to the pumps—see if they are delivering a steady flow of coolant. And while you are examining them remember that "Gusher" has not yet failed to produce a continuous, voluminous flow of coolant, under ordinary circumstances and that there is a "Gusher" for every requirement.

MODEL ULO

GUSHER COOLANT PUMP



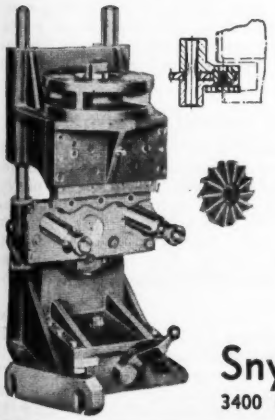
MODEL BLR

We shall gladly send our catalog, giving complete information about our most popular pumps.

THE RUTHMAN MACHINERY CO.
532 EAST FRONT STREET CINCINNATI, OHIO

SNYDER TOOLS

Snyder Possibilities *are unlimited!*



WHEN it comes to solving unusual or complicated problems . . . SNYDER possibilities are unlimited.

Take, for instance, the SNYDER set-up illustrated here for doing a light milling job. This special milling head and SNYDER Fixture are used for back spot facing three small bosses at one time.

What is your problem? Take advantage of SNYDER possibilities . . . send us your blue prints!

Snyder Tool & Engineering Co.
3400 EAST LAFAYETTE AVENUE DETROIT, MICHIGAN

mechanism throughout the machine. The box-section column provides a large reservoir for lubricant. An oil filter operates continuously. Since the knee is completely inclosed, a small constant-speed pump is used to give automatic flooded lubrication.

Automatic Electrical Control for Fellows High Speed Gear Shapers

When arranged for motor drive, the Fellows High Speed Gear Shaper is now provided with an automatic electrical control. The control is operated from a push button station, which is shown in Fig. 1, mounted on an auxiliary bracket. The machine is started by pushing the "Start" button, and can be stopped at any point in its cycle by pushing the "Stop" button. This arrangement provides for convenience in setting up the machine.

The machine is stopped automatically, when it has finished its operation cycle, through an electrical control switch that is attached to an extension on the rear of the motor bracket. This switch is operated by a plunger as shown in Fig. 2, which in turn is acted upon by a cam that is held on the same shaft as the regular feed cam, and is timed with the latter. When the roll on the saddle operating rack reaches the high point on the feed cam, and just before the roll drops into the depression, the switch operating cam lifts the plunger, breaking the circuit and stopping the machine. Then when the roll drops into the depression on the feed cam, allowing the saddle to return to its rear position, the plunger drops into the depression on the control cam, closing the circuit and allowing the machine to be started again.

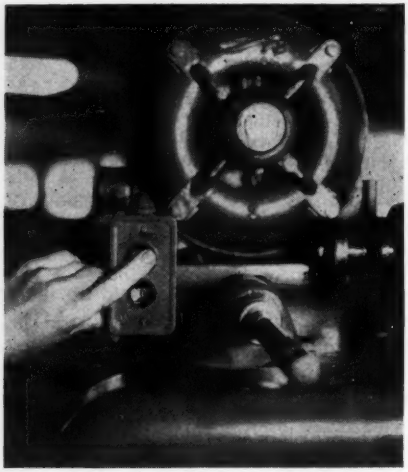


Fig. 1—Close front view of Fellows High Speed Gear Shaper, showing push button control supplied when machine is equipped for motor drive.

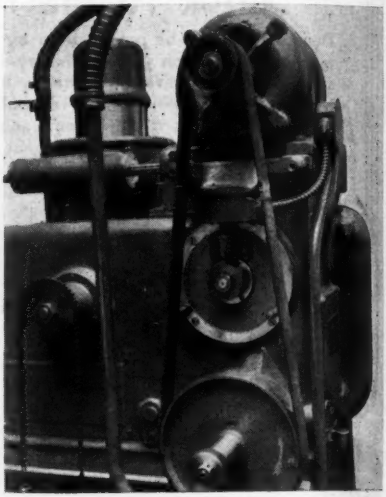


Fig. 2—Rear view of machine, showing automatic electrical switch and operating mechanism for stopping the machine.

"Baby Grand" Etchograph

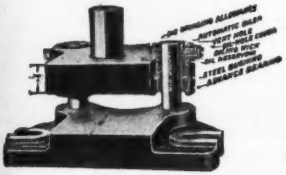
To meet the need for an electric marking instrument especially adapted for marking cutting tools, gages, test pieces, and small parts, where two marking heats will do all the marking, William Brewster Co., Inc., 50 Church Street, New York, N. Y., has brought out the "Baby Grand" Etchograph shown in the illustration.

The instrument is all metal enclosed and is equipped with a substantial handle for transporting about the shop. It is designed for two heats, the No. 1 heat to be used for etching micrometers, gages, small drills, and similar tools, and the No. 2 heat to be used when etching larger

BAUMBACH

Automatically Oiled

DIE SETS



Standardized die sets, embodying many exclusive features, and a listing of 70,000 stock sizes afford a service that is unsurpassed.

Your Inquiries Solicited
Send for New 120 Page Catalog

E. A. Baumbach Mfg. Co.
1806 S. Kilbourne Ave. Chicago, Ill.

WHS

SPEED REDUCERS

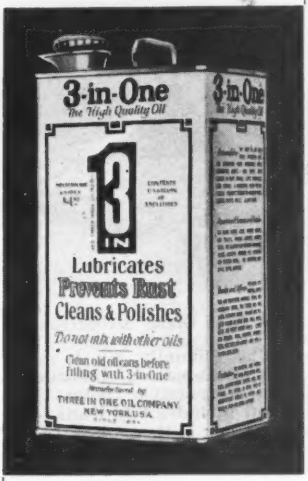
Ratio of Reduction
3-1 to 2500-1
up to 5 H. P. Capacity

Send for Catalog

Winfield H. Smith, Inc.
30 EATON STREET
SPRINGVILLE, ERIE CO., NEW YORK

3 oils in one

. . . for *better* lubrication . . .



Special blending of three oils—*animal, mineral* and *vegetable* — makes 3-in-One penetrate faster; protect longer. And as it *oils,* it also *cleans* and *prevents rust.* Send for circular and prices today.

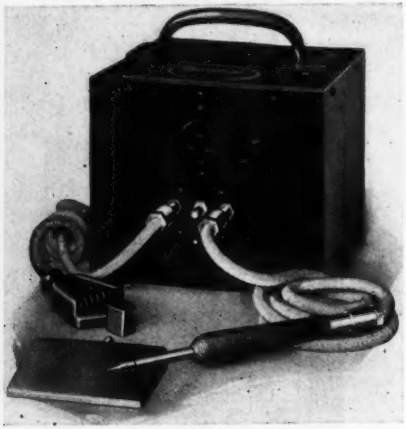
THREE-IN-ONE OIL CO.
DEPT. A-140
170 Varick St., New York
260 Second Ave., Ville St. Pierre Montreal, Que.

3-IN-ONE OIL

FOR INDUSTRIAL USERS

tools, such as jigs or fixtures, hammers, and similar equipment.

The Baby Grand is equipped with the Elkonite pencil and tip, which is replaceable. The Elkonite tip is of copper-tungsten combination, insuring a practically indestructible point. Standard equipment includes two leads, one to the pencil and one with a powerful clip that may be attached direct to the work. Where the work has a good contact surface and can be adapted to a surface plate, the clip may be attached direct to the surface plate. The plate is also furnished. The Baby Grand Etchograph is built for use with either 110 or 220 volt circuit, A. C., 25, 50, or 60 cycle. Where direct current only is available, a converter can be supplied.



Baby Grand Etchograph

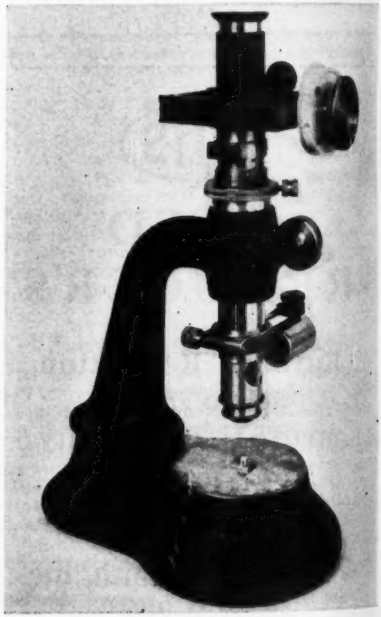
Societe Genevoise Precision Microscope

A micrometer microscope for the accurate checking and control of small pieces or for precision measurements on standard scales or circular divisions is announced by the Societe Genevoise d'Instruments Physique through its American representatives, the R. Y. Ferner Company, Investment Bldg., Washington, D. C. This microscope is known as the Model 281-D. It is especially adapted for checking the profiles of small gears or screw threads, for measurements of fine wires, textile fibers, diamond dies, jewel bearings, and so on.

The micrometer of this instrument is of a highly improved type. The screw is made of a special heat treated steel and is cut and checked with the highest precision. It is fitted and lapped in its bronze nut. The thrust bearing of the screw is a sapphire, ground optically flat to eliminate periodic error and to insure accurate working of the screw. A counteracting spring eliminates any play.

The graduated surface of the micrometer drum is of a new white material that has a matt finish to facilitate reading. A large milled drum makes sensitive readings of the head a simple operation. The divisions are so fine that accurate estimates of tenths of a division can readily be made. A glass turn counter in the field of the eye-piece is so graduated that to obtain the complete reading it is merely necessary to set down successively the numbers indicated on the turn counter and the micrometer head. An adjusting screw is provided by which the graduations of the turn counter can be set to agree with the cross wires of the reticle when the micrometer head is set to zero. The reticle consists of parallel spider threads.

The eye-piece is mounted on a small



Societe Genevoise Precision Microscope, Model 281-D

Quickly Pays

For Itself -Then Earns

PROFITS

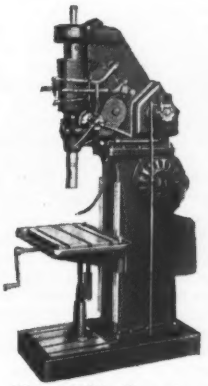
THAT . . . in a few words . . . is what users say about the UNIVERSAL Boston Angle Plate. They'll tell you how it is constantly busy on drill presses, milling machines, grinders, planers, etc. . . . how it saves on the set-up time . . . how these savings pay for the tool in two months' time and then earn profits for you.

Let us show you a few practical applications of this tool . . . they will suggest many more uses in your shop.

Send For a Bulletin

U. S. AUTOMATIC BOX MACH'RY CO.
459 Watertown Street
NEWTONVILLE, BOSTON, MASS.

Self-Oiling All-Geared Drills and Production Units Cut Costs

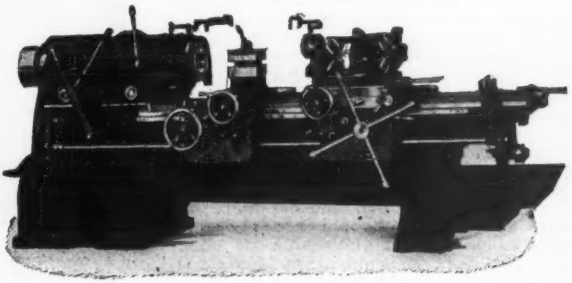


No. 221½—Capacity 1½", swing 22".

Write For Driller Catalog U

BARNES DRILL CO.
801-851 CHESTNUT ST.
ROCKFORD, ILLINOIS, U. S. A.

ACME Features *Will* Cut Your Costs!



AND, you can depend upon an ACME Universal Turret Lathe for lower costs, because of the features incorporated in its design.

These features include twelve reversible spindle speeds, twelve independent reversible feeds in apron, heat treated sliding gears, multiple disc clutch, roller bearing superior mounted spindle and many others.

Submit your problems to our field engineers and research department.

The Acme Machine Tool Company

CINCINNATI, OHIO

carriage which slides in the top of the micrometer box under action of a rack and pinion. This arrangement permits placing the eye-piece over the center of that part of the field in which the measurements are made, to further reduce any distortion of the image which is primarily corrected by the achromatic lenses of the eye-piece. The focusing of the eye-piece is rendered easy by the use of a spiral groove in the fitting and a pin working in it so that an accurate focus may be obtained by rotation of the ocular.

The microscope tube just below the micrometer box is fitted with a collar of exactly the right length to give the exact screw value of 0.005 in. or 0.1 mm. per rev., and makes it possible to dismantle the microscope without danger of losing the original calibration. Below this collar is a focusing ring with a fine screw thread by which the whole microscope may be raised and lowered in its support. This adjustment, when made, can be locked.

Just above the objective is a prismatic illuminating device, illuminated by a miniature Osram lamp of 4.5 volts, mounted in a tubular holder which is attached to the microscope tube and fully adjustable. A green monochromatic filter in front of the lamp further reduces eye strain and provides higher resolving power.

The objective, which is of the double type, is specially designed for metrological use, having a large numerical aperture with resulting high resolving power. In the microscope 281-D it has a magnification of 5X which, with the magnification of 8.3X of the eye-piece, gives a total magnification of 41.5X for the instrument. The working distance of the objective is 20 mm. In another more precise microscope, the No. 286-D, the objective has a magnification of 7.5X, giving a total magnification of 63X. In this instrument one division of the micrometer head is only 0.00002 in. or 0.0005 mm.

A third microscope, of still higher accuracy, designated as No. 287-D, with a total magnification of 96X, is also available. This instrument is intended primarily for the taking of geodetic base bar measurements or for transverse or longitudinal comparators for standardization and calibration of the most precise length standards, such as reference and working standard yard and meter bars. This microscope reads to 0.00001 in. or 0.00025 mm. per division, and accurate estimates may be made to a millionth of an inch or a fortieth of a microm.

The stand for the 281-D microscope shown in the illustration is of rigid construction. The table is 2¾ in. in diameter and there is a working dimension of 3⅞ in. from the center of the table to the edge of the supporting arm. The table is of special cast iron, carefully scraped.

National-Cleveland Die-Forged High-Speed Steel Side Milling Cutter

The National Tool Company, Cleveland, Ohio, is now making a side milling cutter of high speed steel, the cutter being die-forged from the billet. The web recesses are unfinished. The cutter can be provided in all standard sizes from 3 in. diameter up.

National-Cleveland Die-Forged High Speed Steel Side Milling Cutter

Federal Model 493 Wire Gage

The Federal Products Corporation, Providence, R. I., has brought out the Model 493 Wire Gage shown in the illustration. The gage has a range of from .0 in. to .2 in., and is graduated in thousandths of an inch. The anvils are interchangeable and any size desired can be furnished.

A compensating weight aids in adjust-

DRILL

VISE

With and Without Jig Attachments

3 sizes, 6", 9" and 12" jaws

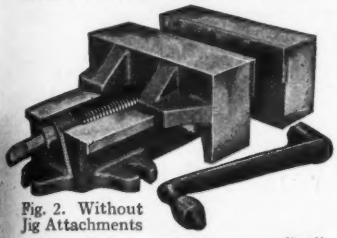


Fig. 2. Without Jig Attachments

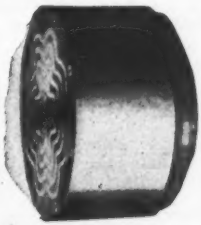
A good one for general shop use on Driller, Miller, Shaper or Planer. Flanged all around bottom for bolting down, with three slots at large end not shown.

ANY VISE WILL PAY

THE GRAHAM MFG. CO.

69 Willard Ave. Providence, R. I.

Standardize ON D & W Chucks



STANDARDIZATION pays, particularly when the tool is as far ahead of its class as the D & W chuck. Oil and waterproof, it is designed and constructed to give maximum holding surface with exceptionally strong and uniform pull throughout. Cables are protected by rubber tubing — special demagnetizing switches for readily releasing the work.

Complete information on request.

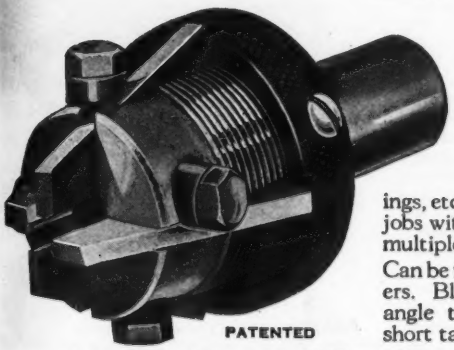
INDESTRUCTIBLE D&W MAGNETIC CHUCKS REG. U.S. PAT. OFF.

J. & H. ELECTRIC COMPANY

202 Richmond St.
PROVIDENCE, R. I.

Genesee Adjustable Hollow Mill

Made in 7 different styles



PATENTED

Has adjustable, replaceable blades and can be replaced at nominal cost, making it unnecessary to continually buy new tools.

The ideal tool for finishing your forgings, castings, etc. Do your several operation jobs with Genesee inserted blades multiple operation tools.

Can be fitted with drills and reamers. Blades can be ground any angle to point work and turn short tapers.

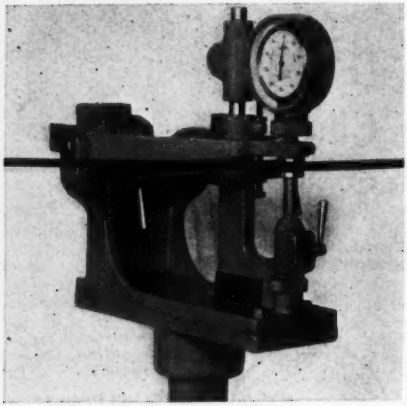
A Genesee Adjustable Hollow Mill can be made for every job

WRITE FOR CATALOGUE

GENESEE MANUFACTURING CO., Inc.

ROCHESTER, NEW YORK

ing the indicator for the desired tension, and a safety rocker arm is provided with which the anvils may be held out of con-



Federal Model 493 Wire Gage

tact. An adjusting screw makes it possible to set the gage instantly for any desired size. Guide rollers are optional. The indicator is enclosed in a dust-proof auxiliary housing.

"Buffalo" Universal Iron Worker

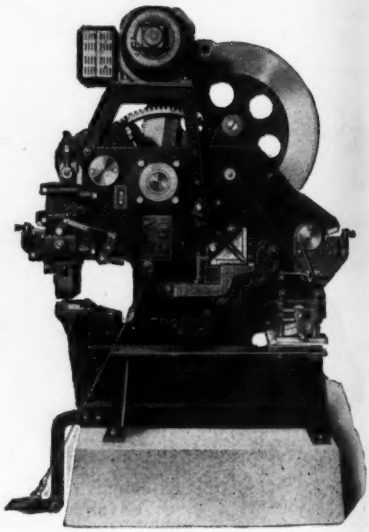
A machine in which are combined the facilities of a punch, shear, and bar cutter, in one end of which either a "built-in" coper or notcher can be used, interchangeably, with a notcher in the punch end, has been placed on the market by the Buffalo Forge Company, Buffalo, N. Y. The machine, which is called the "Buffalo" Universal Iron Worker, is ruggedly constructed throughout and will handle the heaviest jobs of cutting rounds, squares, angles, tees, beams, or channels. It will punch holes in flats, plates, or structural shapes; it will shear flats or slit plates.

The frame of the machine is of "Armco-Plate" steel, electrically welded, and is guaranteed indefinitely against breakage. For shops that use the punch more than the bar cutter or shear, the 90-deg. notching tools are now furnished on the shear end instead of the punch head. Square coping tools can be furnished on the shear end only, and are interchangeable with the 90-deg. notching device mentioned above. While tool changes require only 15 minutes, busy shops will find it advantageous to have the square coper on the shear end and the 90-deg. notcher in the punch head.

The 90-deg. notcher will also cope the ends of beams and channels (flanges only) or angles and tees square by inserting the material diagonally, and suitable stops are provided for either square coping at the end or 90-deg. "V" notching in the center. For both operations, the material is fed into the machine without tilting, making it easy for the operator to cut on the line. The two supports for the dies are welded to the frame, obviating the use of studs to carry the load. The stiffness of the frame is augmented by the use of a heavy king pin on which the bronze-bushed rocker oscillates.

All gears have cut teeth, and a noiseless pinion is used on the motor shaft. The two king pins, alloy steel drive shaft, and forged steel eccentric are all bronze-bushed. Spiral gears are used for the stripper adjustment. The die-block is held by a single screw, allowing for quick change of the blocks. The frame is well reinforced with stiffeners which, together with the front and rear brackets, are welded to the frame.

The machine is made in three sizes, the punch capacities of the three machines



"Buffalo" Universal Iron Worker

being ¾ x ⅜ in., ⅞ x ⅝ in., and ⅞ x ¾ in. The capacities of the bar cutter with standard knives are (rounds) 1¼ in., 1⅝ in., and 1⅞ in. With special knives

If YOU are interested in cutting your Bronze Bearing Costs 50%

"SABECO" METAL

INGOTS, SOLID BARS, CORED BARS, CASTINGS FINISHED TO SPECIFICATIONS

The Certified Bearing Bronze

Use the Coupon

FREDERICKSEN COMPANY
841 S. Water St., Saginaw, Mich.

We are interested in cutting our Bronze Bearing Costs 50 per cent. Send us complete information.

Name.....

Firm.....

Address.....

Accurate enough for Aviation!

NO other industry demands Accuracy like aviation . . . parts must be made right . . . to close limits . . . lives depend upon it!

ECLIPSE Tools meet aviation's accuracy requirements. The illustration shows a special set-up of ECLIPSE tools "In Action" core drilling and counterboring valve tappet bosses in the crank case of a prominent radial aviation motor. Note that the holders are bushing guided, having stop nuts for depth control, and are adjustable for length.

ECLIPSE Tools are equally efficient in other industries . . . your industry. Find out what they will do for you. Send the coupon for a catalog.

ECLIPSE COUNTERBORE CO.
DETROIT MICH.

ECLIPSE COUNTERBORE CO.
Detroit, Mich.
Please send a copy of the No. 32 Catalog to:
Name.....Title.....
Firm.....
Address.....
City.....State.....

(beams and channels) 4 in.-7½ lb., 5 in.-9¾ lb., and 6 in.-12¼ lb. The number of strokes of the No. 0 machine is 36; the No. ½ machine, 30, and the No. 1½ machine, 25 strokes per minute. Height of stroke, ⅞ in., 1⅛ in., and 1¼ in. Flywheel r.p.m., No. 0 and No. ½ machines, 225. No. 1½ machine, 200. Motor required for the No. 0 machine, 2 h.p. For the No. ½ machine, 3 h.p., and for the No. 1½ machine, 5 h.p. Floor space required, 2 ft. 4 in. x 3 ft. 6 in.; 2 ft. 10 in. x 4 ft. 2 in.; 3 ft. 6 in. x 5 ft. 10 in. Weights, 1,875, 3,650 and 6,300 pounds.

B & S Spiral Two-Lipped End Mill, Shell End Mill Arbor, Cutter Adapter, and Screw Arbor

The Brown & Sharpe Mfg. Co., Providence, R. I., has announced the development of several new types of two-lipped end mill, shell end mill arbor, cutter adapter, and screw arbor for use with the adapter, all of which have unique features of design. The adapters are furnished in two different styles for use with milling machines having standardized spindle ends, and in one style for use on milling machines having tapered or threaded-nose spindles. Either adapter is furnished with a milling machine standard taper hole into which the shank of the end mill or arbor fits.

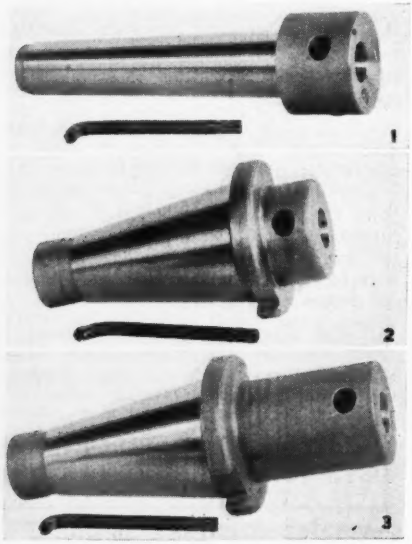


Fig. 1—B & S cutter adapter for milling machine with taper or threaded-nose spindle. Fig. 2 and 3—Adapters for use in milling machines having standardized spindle ends.

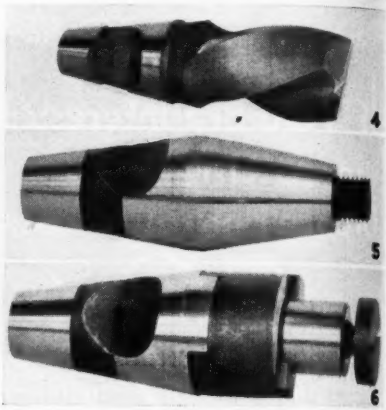


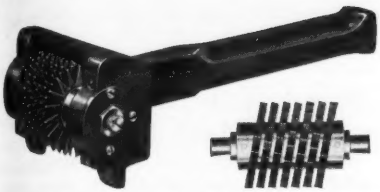
Fig. 4—B & S Spiral Two-Lipped End Mill. Fig. 5 and 6—Arbors for Shell End Mills.

The end mill or arbor is held securely to its seat by a cam which provides a positive drive. The surface of the cam engages the flat surface of the groove in the shank of the cutter, as can be seen by the illustration. When the cam is turned to release it, the cutter or arbor drops from the adapter, the steep taper preventing the piece from sticking, and insuring quick release. The cam is turned by means of a wrench with a splined end which fits into a corresponding splined hole in the end of the cam.

These adapters, arbors, and end mills are furnished in a desirable range of sizes.

Desmond Heavy Duty Grinding Wheel Dresser

The Desmond-Stephan Mfg. Co., Urbana, Ohio, has brought out a grinding wheel dresser especially designed for use in dressing large and coarse grinding wheels, particularly those of Bakelite or rubber bond. The cutters are of tool steel, and are set at an angle which provides a shearing action in addition to the

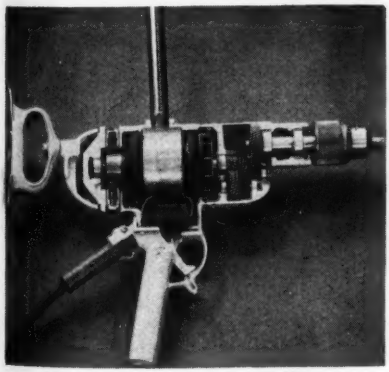


Desmond Heavy Duty Grinding Wheel Dresser With Extra Set of Cutters

usual rotary action, making them especially effective in the dressing of these special bonded wheels. As the wheels revolve at very high speeds, the cutter spindle has been mounted in dust-proof ball bearings, insuring the maximum of service and ease of operation. The handle is of heavy construction and will withstand rough usage. Provision is made for adjusting the spindle to take up any end play that might develop in use. The cutters may easily and quickly be changed by removing four large screws. The dresser will operate equally well on either silicate or vitrified wheels.

Wappat Improved "Red Streak" Drills

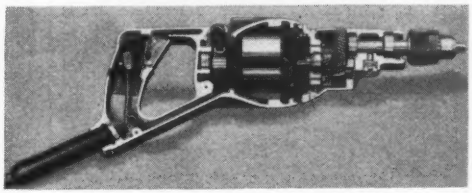
A number of new and improved mechanical features have been incorporated in the design of the Wappat "Red Streak" Portable Drills, manufactured by Wappat, Incorporated, 7524 Meade Street, Pittsburgh, Penna. These improvements



Wappat ½-in. Heavy Duty Drill

are said to result in faster drilling time and longer tool life.

In the Wappat Heavy Duty Drill, every bearing is a ball bearing. The armature shaft rotates on ball bearings, as does also the front and rear bearing points of the spindle and the intermediate gear shafts. Both the bearings and gears in the gear chamber run in grease, sealed to exclude the dirt and dust and retain the grease. Other features of these drills include streamline design, perfect balance for ease in operation, cut helical gears of heat treated alloy steel, super-powered Universal motor, and fan mounted on the armature shaft to provide ventilation. The spindle housing is



Wappat ¼-in. Heavy Duty Drill

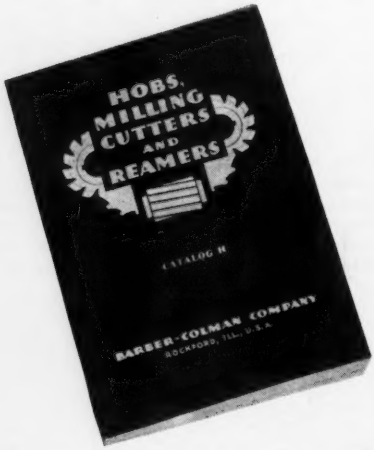
machined and is in perfect alignment, which makes accurate mounting in a drill stand possible.

Barber-Colman Co. Catalog "H"

A combined handbook and catalog of hobs, milling cutters, and reamers, designated as Catalog "H," is now ready for distribution by The Barber-Colman Company, Rockford, Ill. The book is divided into three principal parts, the first of which is devoted to standard and special hobs, hobbing machines, and engineering information connected with gear cutting. The second part describes standard and special milling cutters of all types, made in accordance with the American Standard for Milling Cutters as approved by the American Standards Association, and the third part of the book covers the subjects of standard and special reamers and the reamer sharpening machine.

Outstanding features of Catalog H include an exhaustive explanation of spline shaft hobs and their uses, with particular reference to the newly-developed elongated tooth hob, and complete new tables of spline shaft dimensions. New lists of standard milling cutters that are made

to standard specifications are included, and for the first time Barber-Colman presents a full list of reamers with in-



formation of especial value to manufacturers who ream to close limits.

Two hundred pages of ready reference, pocket size, are filled with tables, illustrations, and diagrams of general interest to the technical man or organization. The book should be valuable as a reference, both in the plant and in the drafting room.

A copy of Catalog H will be sent to any mechanical executive upon request.

Siewek Adds Line of Box and Leaf Jigs

The Siewek Tool Co., 10230 Woodward Avenue, Detroit, Michigan, has augmented its line of rapid-clamping drill jigs, fixture locks, and drill heads by the addition of a complete line of box and leaf jigs. The leaf jig is of the handle type, with a cam for locking the lid, and drilling can be done from all four sides. The body of the jig is of aluminum, with steel rest buttons on the feet. The box jig is of the conventional type with a jig lock screw for clamping the lid, and drilling can be done from six sides. The body of the box jig is of semi-steel.

The box and leaf jigs are especially popular on low production jobs, although a number of such jigs are giving excellent service on high production jobs. The sizes as made by the Siewek Tool Company are ranged to meet practically all requirements and special sizes can be supplied when required.

Siewek Box Jig

Siewek Leaf Jig

Conveyor At G-E Plant

(*Continued from page 32*)

started until the operator receives word that all is clear. At all places where the material in transit on the conveyor hangs lower than seven feet from the floor, safety switches are installed within reaching distance. Signal horns, so located that they can be

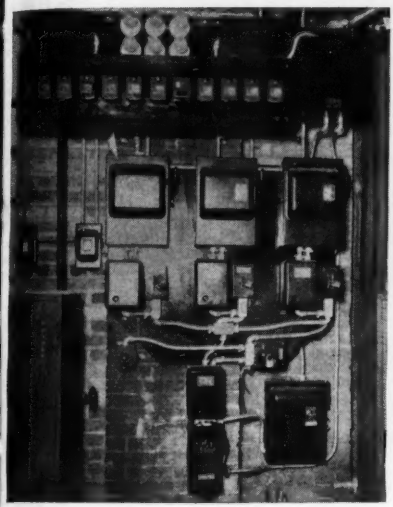
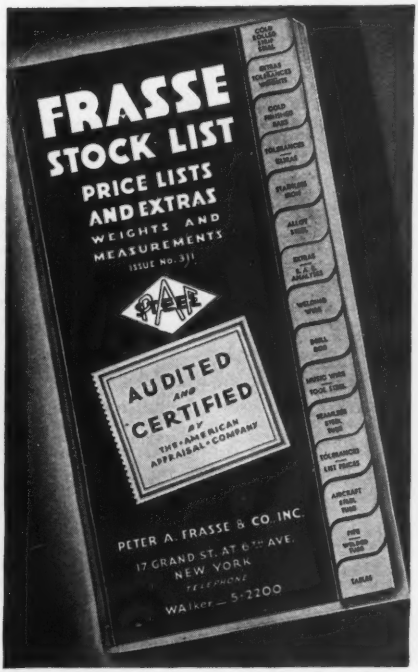


Fig. 4—The control board with annunciator system, signals, horn, lights, and so on.

heard at all points along the route of the conveyor, are sounded for ten seconds before the conveyor is started.

When the conveyor is stopped by someone along the line of travel, the operator can tell immediately, by means of an annunciator system, which switch is involved. He can then telephone to the point where the switch was thrown and find out when to start the conveyor. In addition to the annunciator signals, a horn on the control board blows when the conveyor stops, calling his attention to the fact that it has been stopped. A signal light system is also used, indicating what section of the conveyor drive is involved in case of trouble.



STEEL BUYERS!

For economical, efficient shop production use our new

CERTIFIED STOCK LIST

This absolutely dependable catalogue of the most complete warehouse stocks in the East enables steel users to maintain low inventories without sacrificing production schedules. It also contains valuable reference tables of shop data.

If you have not received a copy write today to our nearest office.

PETER A. FRASSE & CO., Inc.

17 GRAND STREET	NEW YORK
3717 WISSAHICKON AVE.,	PHILADELPHIA
50 EXCHANGE STREET	BUFFALO
135 WALNUT STREET	HARTFORD

For Your Catalog Library

Check any of these useful publications that you want, write your name, firm name, title, and address on the margin, then tear out the page and send to Modern Machine Shop, 128 Opera Place, Cincinnati, Ohio. They will be forwarded to you promptly without cost or obligation. Please restrict your list to not more than ten.

Grinding Tungsten Carbide Tools: Instructions on grinding tungsten carbide tools, including directions as to angles, types, grades, and grains of wheels, wheel speeds, and so on, are included in a folder that can be obtained without charge by addressing Abrasive Company, Tacony and Fraley Streets, Philadelphia, Penna.

Ames Gages: Catalog No. 50, issued by the B. C. Ames Company, Waltham, Mass., contains complete descriptions and illustrations of the dial gages, gage heads, upright gages, cylinder gages, dial micrometers, and precision verifiers, special gages and attachments made by this company. Copy free upon request.

Scraping By Power: Bearing surfaces can now be scraped with a power scraper that is quicker and easier than the old-fashioned hand method. The tool is described in a folder that is issued by Anderson Bros. Mfg. Co., 1926 Kishwaukee St., Rockford, Ill. Sent free on request.

Steel Furniture for the Shop: The complete line of steel furniture made by the Angle Steel Stool Co., Plainwell, Michigan, including steel stools and chairs, steel foremen's desks, lockers, tables, tool stands, machine tenders, shop boxes and pans, iron bar racks, trucks, bench legs, and bench drawers, is described and illustrated in Catalog "C." which is issued free to machine shop executives.

"Steelgrip" Universal Puller: Gears, wheels, or pulleys can be removed from shafts, regardless of the distance from the ends, by the aid of a puller that is made by Armstrong-Bray & Co., 668 Eagle Street, Chicago, Ill. Bulletin on request.

Machine Shop Accessories: Catalog B-27, issued by the Armstrong Bros. Tool Co., 328 N. Francisco Ave., Chicago, Ill., describes the line of tool holders, boring tools, wrenches, pipe tools, ratchet drills, lathe dogs, and other tools manufactured by this company.

Hold Odd-Shaped Pieces Securely: A vise in which odd-shaped work can be held securely without the need of special jaws or fixtures is described in a folder that has been issued by The Avey Drilling Machine Co., P. O. Box 487, Cincinnati, Ohio. Copy free upon request.

Hobs and Milling Cutters: A complete line of milling cutters and hobs for cutting all kinds of gears, splines, sprockets and other forms is described in Catalog G, issued by the Barber-Colman Company, Rockford, Ill. Descriptions and illustrations of the Barber-Colman hobbing machine and hob-sharpening machines are included. Sent free on request.

All-Geared Drilling and Tapping Machines: A catalog describing in detail the various types of all-geared, self-oiling, drilling and tapping machines made by the Barnes Drill Co., 801-851 Chestnut Street, Rockford, Ill., will be sent free upon request.

Modern Drilling Equipment: Circulars describing the various types and sizes of Barnes upright drills, multiple drills and horizontal drilling machines made by this company have been issued by the W. F. & John Barnes Co., Rockford, Ill.

Greenerd Arbor Presses: Catalog No. 36, issued by the Edwin E. Bartlett Co., Nashua, N. H., describes and illustrates all the various types and sizes of arbor presses made by this firm. Copy free upon request.

Automatic Oiled Die Sets: The automatic oiled die sets, die shoes, punch holders, leader pins, bolster plates, bushings, and other standard die parts made by the F. A. Baumbach Manfg. Co., 1806 S. Kilbourn Ave., Chicago, Ill., are described in Catalog No. 5, which has been issued by that company. Sent free upon request.

Boker Keyless Chuck: A chuck that is built of three units, grips like a vise, and needs no key is described in a pamphlet that can be obtained by addressing H. Boker Co., Inc., 103 Duane St., New York, N. Y.

Mounted Grinding Wheels for use in small holes such as are found in bushings, dies, gears, tools, etc., are described in a catalog that has been issued by the Chicago Wheel & Manfg. Co., 110 S. Aberdeen St., Chicago, Ill. Copy free upon request.

Rapid Traverse Planers: Cincinnati Hypro Planers, made by the Cincinnati Planer Co., Cincinnati, Ohio, are described in a new catalog that has been issued by this company.

Handbook For Drillers: The Cleveland Twist Drill Co., 1242 E. Forty-ninth St., Cleveland, Ohio, has published a book in which the various parts of the twist drill are described, and which tells how to grind a drill correctly. The troubles that result from incorrect grinding are described and illustrated and several chapters are devoted to the subjects of speeds, feeds, materials, cutting compounds, and so on. Sent free upon request.

Tool Steel Handbook: This catalog, published by the Columbia Tool Steel Company, 550 E. 14th Street, Chicago Heights, Ill., contains descriptions and information as to correct use of tool steels. Also hints on how to avoid hardening failures, with information on heat treating methods and valuable information tables. Copy free upon request.

Motorize Your Cone Pulley Lathes: An attachment that can be applied to your lathe with four bolts makes it possible to motorize and modernize your lathes. Write for information to Cullman Wheel Co., 1336 Altgeld St., Chicago, Ill.

Davis Keyseaters: Recent developments in keyseating methods are discussed in a bulletin that also describes the keyseaters made by the Davis Keyseater Company, 250 Mill St., Rochester, N. Y. Copy free upon request.

Grinding Wheel Dressers: All of the different types of grinding wheel dressers made by the Desmond-Stephan Mfg. Co., Urbana, Ohio, including Desmond-Huntington, Desmond-Sherman, Zig-Zag, Diamo-Carbo, and diamond dressers, are described and illustrated in a catalog that has been published by the firm mentioned. Free upon request.

Precision Grinding: A booklet which describes and illustrates the most modern methods of performing all kinds of precision grinding operations, showing how the Dumore grinder can be applied to various kinds of machine tools, has been published by The Dumore Company, Racine, Wis. Copy free upon request.

Interchangeable High Production Tools: Catalog No. 21, issued free by the Eclipse Counterbore Co., 7410 St. Aubin St., Detroit, Mich., describes and illustrates the interchangeable counterbores, spot facers, end form cutters, and other end cutting tools made by this firm.

Mounted Grinding Wheels

For all small holes (open or blind), races, bushings, etc., and most any place hard-to-get-at; as on dies, tools, gears, etc. Hundreds of sizes, shapes, any shank.

CHICAGO WHEEL & MFG. CO.

406 East Woodbridge St. DETROIT

110 South Aberdeen St. CHICAGO

Greenerd Arbor Presses

Write for our Catalog showing 64 different styles

EDWIN E. BARTLETT CO.
NASHUA, N. H.

Columbia TOOL STEEL

CLARITE HIGH SPEED STEEL
OILDIE NON-SHRINKING
COLUMBIA SPECIAL CARBON TOOL STEEL
COLUMBIA EXTRA, ETC.

It pays to use Good Tool Steel.

COLUMBIA TOOL STEEL COMPANY
MAIN OFFICE AND WORKS
550 E. 14TH STREET CHICAGO HEIGHTS, ILLINOIS

CHICAGO DETROIT NEW ORLEANS ST. PAUL
CINCINNATI KANSAS CITY NEWARK SAN FRANCISCO
CLEVELAND LOS ANGELES PORTLAND SEATTLE
DENVER MILWAUKEE ST. LOUIS WORCESTER

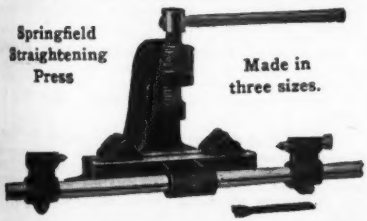
Steelgrip Universal Puller

An improved puller for removing gears, wheels or pulleys any distance from the end of shaft. Quickly pays for itself! Write for prices.

Armstrong-Bray & Co., 668 Eagle Street Chicago, Illinois

CUT YOUR STRAIGHTENING COSTS

Springfield Straightening Press



Made in three sizes.

THE Springfield Straightening Press is the ideal tool for straightening any length of rough or finished work—truing sprung tools—testing and balancing cams, or crank shafts—and scores of other jobs.

Place it on the bench—it saves your operators' time by eliminating waste steps, and allowing quicker handling of work.

Send for illustrated folder suggesting many uses.

The Springfield Machine Tool Co.
630 West Southern Avenue Springfield, Ohio
We also manufacture Engine Lathes and Shapers.

Lathe Turrets of eight different types and twelve sizes are described and illustrated in Circular No. 18, issued by Fay & Scott, Dexter, Maine. Copies free upon request.

Precision Measuring Instruments: The latest types and models of dial indicators, thread lead test gages, pitch gages, thickness gages, dial comparators, and other precision measuring instruments marketed by the Federal Products Corporation, Providence, R. I., are described and illustrated in a book that will be sent free upon application to this firm.

The Involute Gear Simply Explained: A direct, clear explanation of the theory and principles of involute gearing without the use of higher mathematics can be obtained without charge by addressing The Fellows Gear Shaper Co., 78 River St., Springfield, Vt.

Formica Silent Composition Gears: A booklet telling about the uses and advantages of Formica Silent Shock Absorbing Gears, and containing a considerable amount of valuable data with rules and tables for laying out, cutting and using gears. Sent free by Formica Insulation Co., 4632 Spring Grove Avenue, Cincinnati, Ohio.

Steel Stock List: Steel buyers who send their names and addresses to Peter A. Frasse & Co., Inc., 17 Grand St., New York City, will each receive a catalog of the warehouse stock maintained by this company. The catalog also contains valuable reference data.

Reduce Your Bearing Costs: A bearing metal that is proof against burning, scoring, seizing, corroding, or pounding out is being made by the Fredericksen Company, 841 South Water Street, Saginaw, Michigan. Send for information.

Tungsten-Carbide Tipped Tools: The boring tools, counterbores, form cutters, facing heads, reamers, spotfacers, and other tools made by The Gairing Tool Co., 1629 West Lafayette Blvd., Detroit, Mich., made with or without tungsten-carbide tips, are described and illustrated in Catalog No. 20. Copy free upon request.

Adjustable Blade Cutters: Hollow mills, facing tools, face mills, milling cutters and other production tools with adjustable, interchangeable blades are described and illustrated in a booklet that is issued free by the Genesee Manufacturing Co., 141 N. Water St., Rochester, N. Y.

Take Care of Your Tools by keeping them in a convenient, strong, and fine-looking chest. A catalog of tool chests, complete with descriptions and illustrations, can be had by addressing H. Gerstner & Sons, 1283 Columbia Street, Dayton, Ohio.

Machine Vises of all sizes for use with machine shop equipment are described in a circular that will be sent free upon application to The Graham Mfg. Co., 69 Willard Ave., Providence, R. I.

Greaves-Klusman Lathes: A book containing complete descriptions of the latest types of lathes made by this firm has been issued by the Greaves-Klusman Tool Co., Oakley, Cincinnati, Ohio.

Drawing Tables: The Hamilton steel-base, adjustable drawing table is described in Catalog No. 7-MS, issued by the Hamilton Mfg. Co., Two Rivers, Wis. Copy free upon request.

Texdrive Grinders for Vitrified or High Speed Wheels: A six-page bulletin No. 43 describes in detail and illustrates the advantages of the new Hisey Texdrive Grinder —stressing especially the multi-speed and single-speed machines. Write for a copy to The Hisey-Wolf Machine Co., Colerain and Marshall Sts., Cincinnati, O.

Precision Bench Lathe Work can only be done on finely-built, accurate machines. The complete line of Hjorth Precision Bench Lathes is described and illustrated in a catalog that has been issued by Hjorth Lathe & Tool Company, 24 School Street, Boston, Mass. Copy free upon request.

Useful Tool Information: The Illinois Tool Works, 2503 N. Keeler Ave., Chicago, has published a catalog which describes and illustrates the standard and special cutters, mills, hobs, gear cutters, thread cutters, saws, reamers, and other tools made by this firm. The book also contains a number of useful tables and formulas. Copy free upon request.

Oil and Waterproof Chucks: The J & H Electric Co., 202 Richmond Street, Providence, R. I., is now making a chuck that is oil and waterproof, and is designed to provide a maximum of holding surface with exceptionally strong and uniform pull throughout. Ask for complete information.

Keller Automatic Toolroom Machine for machining dies, metal patterns, jigs, core boxes, molds, and other irregular parts is fully described in a booklet that can be had free by addressing the Keller Mechanical Engineering Corp., 84 Front Street, Brooklyn, N. Y.

Threading Machinery: Catalog No. 32, containing full descriptions of Landis threading machines, stay bolt threading machines, bolt factory threading machines, automatic forming and threading machines and chaser grinders can be had without charge by addressing Landis Machine Co., Inc., Waynesboro, Penna.

Flexibility in Cylindrical Grinding means increased production, need for less equipment, and lower costs. Send for information as to the advantages of Landis Hydraulic Grinders. Address Landis Tool Co., Waynesboro, Penna.

Air-Operated Work-Holding Devices: A booklet showing how air-operated chucks and devices of various kinds can be applied to different kinds of machines to save time and labor has been issued by The Logansport Machine Co., Logansport, Ind.

Rapid-Reading Micrometer: A new type of rapid-reading micrometer, designed to show the reading in numerals, is described in Catalog No. 5, issued by The Lufkin Rule Co., Saginaw, Michigan. The catalog also contains descriptions of the micrometers, calipers, gauges, scales, squares, bevel protractors, and other tools made by this company. Free upon request.

M-C Pinion Rod, made by the Meisselbach-Catucci Mfg. Co., 70 Stanton St., Newark, N. J., insures economy and accuracy in cut pinions. Send for information.

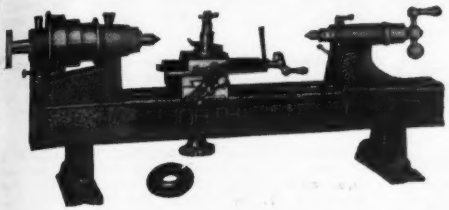
Compound Spot-Facing Tool: A spot-facing tool retracting, serrated roughing cutters and fixed finishing cutters in the same tool will break up the scale easily and do accurate work. Write for bulletin to Mummert-Dixon Co., 120 Philadelphia St., Hanover, Penna.

"The Answer to Your Gear Problems": Information as to correct methods of cutting and finishing gears will be supplied without charge by The National Tool Co., Cleveland, Ohio. This firm also carries a complete stock of gear shaper cutters and markets the National-Cleveland Spur and Helical Gear Grinding Machine.

Ball and Roller Bearing Data Sheets: A complete set of data sheets showing all the dimensions and loads at given speeds, and giving instructions for mounting precision ball bearing and Hoffmann roller bearings, can be obtained without charge by addressing the Norma-Hoffmann Bearings Corporation, Stamford, Conn.

How To Grind Cemented Tungsten Carbide: A booklet which describes and illustrates the correct methods of grinding tungsten carbide tools has been published by the Norton Company, Worcester, Mass. Copy free upon request.

"O. K." Tool System: The O. K. System for lathes, planers, shapers, boring mills, and other production machines consists of special forged steel holders with complete sets of tool bits of special design. Particulars can be had by addressing The O. K. Tool Co., Shelton, Conn.



HJORTH

Precision Bench Lathe

can be used for production, experimental purposes or in the tool room. Don't use a large lathe for work that a "Hjorth" can do. Reduce the overhead! Write for catalog.

HJORTH LATHE & TOOL CO. 60 STATE ST. BOSTON, MASS.

MORE THAN JUST A CLUTCH!

THE PULLMORE INDUSTRIAL CLUTCH is more than "just a clutch." It is, rather, a high grade piece of machinery . . . carefully planned and built to pull heavier loads . . . more efficiently and with less adjustment than any other.

That's why so many well-known manufacturers of high grade machine tools, laundry machinery, cranes, rubber working machinery, etc., use the PULLMORE as a standard part of their product.

Write For Catalog

ROCKFORD DRILLING MACHINE CO.
10 CATHERINE STREET
ROCKFORD ILLINOIS

RIVETT COLLETS

"The finest collets in the world."
Full stock, at all times standard styles including Rivett, Hendey, Cataract Seneca, Becker, etc.

Write for new Bulletin.—100-AM "Rivett Draw-in Collets and Chucks"—also price list

Rivett LATHE AND GRINDER CORP.
Brighton Dist., Boston, Mass.

TOOLS LAST LONGER! SERVE BETTER!

When given care in a *Gerstner* Tool Case.

For 25 Years the choice of Machinists and Toolmakers.

Free Catalog

H. GERSTNER & SONS, 1292 Columbia St., Dayton, Ohio

TEXT BOOK OF ADVANCED MACHINE WORK

TENTH EDITION

By ROBERT H. SMITH, Massachusetts Institute of Technology
Price, $3.25, Delivered—829 pages—928 illustrations.

For Apprentices, Machinists, Foremen and Toolmakers; Technical, Trade, Automobile and Apprentice Schools, and Machine Shops, Universities and Colleges.

New Section 16 treats on Tungsten Carbide Cutting Tools

The Master Book for the machine shop man.

INDUSTRIAL EDUCATION BOOK COMPANY, Box 153, Back Bay, BOSTON, MASS.

"Fastenings" is the title of a booklet, issued by the Parker-Kalon Corporation, 192-196 Varick Street, New York, N. Y., in which are included the results of surveys made in fourteen different plants as to the efficiency of fastening methods. Copy free upon request.

Q-C Standardized Fixture Units in 677 sizes and 5 styles are described and illustrated in the Engineering Book put out by A. H. Pearson, 7 E. Grand Ave., Detroit, Mich. Copy free upon request.

"Most Frequent Mistakes Made in Hardening:" Users of steel can obtain a wall-chart on which are listed the most common mistakes made in hardening tool steels, results of mistakes as shown on the tools, appearance of fracture, and suggestions for remedying the mistakes, by writing to the Poldi Steel Corporation of America, 247 West 18th Street, New York, N. Y.

Shape or Slot With This Machine: The Rhodes Convertible Shaper, made by The Rhodes Manfg. Co., Waltham, Mass., can be used for horizontal shaping or vertical slotting. Details upon request.

Bench Lathe Mounting and Driving Equipment: Bulletin 120-A, issued by Rivett Lathe and Grinder Corporation, Brighton, Mass., contains complete descriptions and illustrations of modern and conventional countershaft, individual motor drive jackshaft, and speed box motor drive, also benches, cabinets, oil pans, etc. Copy free upon request.

Fullmore Industrial Clutch: A multiple disc clutch, made in two types, to run in oil or dry, and which is so built that it can be operated at high speeds, is illustrated and described in a folder that will be sent free by the Rockford Drilling Machine Company, Rockford, Ill.

Hy-Draulic Shaper-Planer: The most modern features are embodied in the design of the Rockford Hy-Draulic Shaper-Planer, which is intended for work that would otherwise go to the small planer or large shaper. Write for folder to Rockford Machine Tool Co., 2414 Kishwaukee Ave., Rockford, Ill.

Automatic Lubrication: Individually motor-driven pumps that keep the work flooded with lubricant are described in a booklet that has been published by the Ruthman Machinery Co., Front and Pike Sts., Cincinnati, Ohio.

Stamp Your Name on Your Product: Full information as to the steel roller dies made by The Schwerdtle Stamp Co., 10 Cannon Street, Bridgeport, Conn., can be obtained by writing this firm.

Rapid Drill Jigs: How time can be saved and drilling operations made easier by the use of a quick-acting drill jig is told in a booklet that is issued free by the Siewek Tool & Die Co., 10230 Woodward Ave., Detroit, Michigan.

Simonds Files: A useful book on files showing the various styles made, their uses, cross-section, and cuts, and containing a number of reference tables and other information useful in a machine shop can be had by addressing Advertising Dept., Simonds Saw & Steel Co., 470 Main Street, Fitchburg, Mass.

The Most Efficient Speed for the operation of special production units, power conveyors, and other machinery by the use of the WHS Speed Reducer and how it can be obtained is told in a bulletin that will be mailed free by Winfield H. Smith, Inc., 30 Eaton St., Springville, N. Y.

A Snyder Tool Set-Up, consisting of a Snyder ball-bearing multiple head, bushing plate, and work holding fixture, will convert a single spindle drill into a multiple drill at small cost. Particulars upon request. Address Snyder Tool & Eng. Co., 3400 E. Lafayette Ave., Detroit, Michigan.

Speed and Accuracy in Straightening: The Springfield Straightening Press is an ideal tool for use in straightening any length or size of rough or finished work. Send for illustrated folder. Address The Springfield Machine Tool Co., 630 West Southern Avenue., Springfield, Ohio.

Stackbins Save Space: Bins which may be used as individual containers, as tote-boxes, or "nested" to form stock-room sections are described in an illustrated circular published by the Stackbin Corporation, Pearl and Rice Streets, Providence, R. I.

Accurate Gages Speed Production: The complete line of snap, plug, ring, pin, dial indicator, and special gages made by the Standard Gage Co., Inc., Poughkeepsie, N. Y., is described and illustrated in Catalog No. 4, which can be had without charge by addressing this firm. Johansson gage block sets and accessories are also listed in this book.

Cutting and Grinding Facts: A discussion of cutting oils and lubricants, together with descriptions and illustrations of various kinds of jobs upon which cutting oils are used, is contained in a booklet that is issued by the Sun Oil Company, Finance Building, Pittsburgh, Pa. Free upon request.

Rigidmilling Principles and Practice: A book that shows how the Rigidmil can be adapted to various kinds of usual and unusual milling operations, and which describes in detail the work that can be handled by this machine has been issued by the Sundstrand Machine Tool Co., Rockford, Ill. Copy free upon request.

Snap, Plug, Ring, and Thread Gages: The complete line of precision gages made by The Taft-Peirce Manufacturing Co., 32 Mechanic Ave., Woonsocket, R. I., is described in a folder which can be obtained, free, by addressing this company.

Penetrating Oil for High-Speed Equipment: Three-In-One Oil, blended scientifically from animal, mineral and vegetable oils, will penetrate the tightest bearings and lubricate high speed units perfectly. Full information can be had by writing Three-In-One Oil Co., Dept. 96, 130 William St., New York, N. Y.

Chuck With Air: How time and labor can be saved by the use of air-operated chucks, cylinders, and other equipment is told in a book which describes "Hopkins" Air-Operated Equipment. Published by The Tomkins-Johnson Company, 620 N. Mechanic St., Jackson, Mich. Sent free upon request.

Change drilling speeds instantly without stopping the machine or touching a belt. This can be done with the Victor Super-Drill, made by U. S. Automatic Box Machinery Co., Newtonville, Boston, Mass. Bulletin free upon request.

Electrically-Driven Portable Tools: The "U. S." line of electric drills, die grinders, electric screw drivers, surface grinders, tool post grinders, and bench and floor grinders is described in Catalog No. 29, which has been published by The United States Electrical Tool Co., 2471 W. Sixth St., Cincinnati, Ohio.

Power Drive in Any Position: The modern flexible shaft makes it possible to drive all kinds and types of tools in places and positions impossible of access with straight-shaft machines. Ask The S. S. White Dental Mfg. Co., Industrial Division, 150A West 42nd Street, New York, N. Y., for the "Flexible Shaft Handbook." Copy free to any mechanical executive addressing this firm on his firm letterhead.

Wrenches For Every Use: "Guaranteed Against Breakage" tappet wrenches, pipe and fitting tongs, offset wrenches, and wrenches for all other uses are described and illustrated in a series of folders which can be obtained without charge by addressing J. H. Williams & Co., Buffalo, N. Y.

He *didn't* count sheep jumping a fence

NO SIR! The guest we have in mind had his own cure for insomnia! He asked us to furnish a thermos bottle full of hot milk, so that he could have it by his bed, in case he woke up at night, take a drink ...and then get to sleep again! Thermos bottles and hot milk aren't part of the standard equipment of United Hotels... but we do have large, airy high-ceiling rooms, with a feeling of pleasant freedom... and the beds... well, if you've ever slept in one of our hotels you know how good they are! So there's very rarely occasion for insomnia at any of the 25 United Hotels.

Extra service at each of the 25

UNITED HOTELS

UNITED HOTELS

In Cleveland-It's

THE HOLLENDEN

at

REDUCED RATE

Now Starting at $2.50 Single - WITH BATH

FOUR-station radio in every room of this most popular hotel, already famed among experienced travelers for its homelike comfort, good food and excellent service.

The $2.50 Single, base rate, is effective in these DeWitt Operated Hotels:

AKRON
MAYFLOWER
C. J. Fitzpatrick, Mgr.

CLEVELAND
HOLLENDEN
E. Hogren, Mgr.

COLUMBUS
NEIL HOUSE
Tom A. Sabrey, Mgr.

A DeWITT OPERATED HOTEL

By GEO. ALEXANDER MANN

Unanimous

"Ed's mustache makes me laugh,"
Said Minnie La Rue,
"Yeh," said Elizabeth,
"It tickles me, too."

One of the best we've heard lately is about the driver of a steam roller who was fired for sneakin' the roller out one night without permission and takin' his sweetie for a joy ride.

Tuff

The poor woman candidate,
We hear from the snorters,
She had to withdraw,
She lost her supporters.

That Wuz a Big Help

Then there's the sap who wanted to weed the garden, but couldn't distinguish between weeds and plants, so he turned the chickens loose and pulled up what was left.

I don't mind her finger waving if she'll keep her thumb away from her nose.

Had Her Guessin'

"What are his intentions?"
She heard dear daddy bark;
"I don't know," said daughter,
"He keeps me in the dark."

Whether we come back or go back depends upon the bone in the back.

The average wife is a live wire—she charges everything.

He Was Wise

"Aunty'll never kiss you,
With that dirty face, you lout"—
Johnny said, "I know it,
I had that figured out."

'Bout the only thing impressive about a skating rink is its seating capacity.

Our mayors were decorated in France—some o' them oughta been crowned.

Same Ol' Story

"You're the breath o' my life,"
He said to Beth,
An' then he proceeded
To hold his breath.

One o' the best golf gags we've had handed us for some time is the one about the guy who asked to go through 'cause he'd just received word that his wife had been rushed to the hospital.

Sez Liz

I give 'em all a chance,
It is no more than fair,
When I find a flat tire,
I use him for a spare.

Your wife may give you credit, but what she wants is cash.